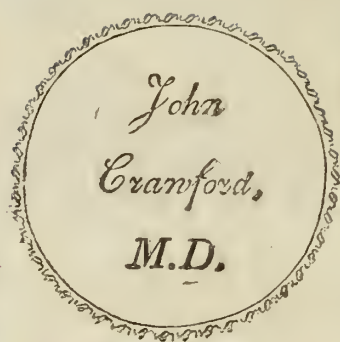






John
Cranford,
M.D.





Bibliotheca Anatomica, Medica, Chirurgica, &c.

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THE
P R E F A C E
T O T H E
R E A D E R.

WE gave a large Account before the First Volume of this Work, and of the Design thereof; so shall be very short now, and only acquaint the Reader:

First, We have made use of the best Authors, and none other in any Language.

Secondly, They were translated or abstracted by several Hands; which, we hope, are done with Care and Exactness, as the Reader will find.

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And so R E A D E R *Farewel.*

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THE THIRD VOLUME OF

Bibliotheca Anatomica, Medica, Chirurgica, &c.

Of the Motion of the Blood; and first of Sanguification and Nutrition. From Harvey, Glisson, Lower, Walæus, Verheyen, Drake, &c.

BEFORE we enter upon the large Field concerning the Motion or Circulation of the Blood, we shall say something of *Sanguification* and *Nutrition*. The Blood then is a warm red Liquor, or the reddest Part of all the Mass of Fluids in the Animal Body, that circulates by Means of the Arteries and Veins through every Part of the Body.

While it circulates in the Vessels, it appears a homogeneous or uniform Liquor; but being let out, as it gradually cools, it separates spontaneously into two distinct Parts, a *Craasamentum* or red coherent Mass, and a *Serum* or transparent Part, which still retains its Fluidity, and being something the more specifically heavy of the two, sustains and bears up the red Part which swims in it; the Proportion of which two in the Mix'd, is ordinarily about one and a half

of the *Serum* to one of the *Craasamentum*. I have pitch'd upon this Proportion (says the Accurate *Drake*) as a *Medium* betwixt the Excesses on both Sides: But the Reader is not to be surpriz'd, if he sometimes finds the Proportion vastly different from what I have here given even in Persons of sound Health; for as to this Point, Nature seems not to have settled any perfect Standard, but the Blood of some will be more watry or serous, of others more fibrous, than this Proportion seems to allow, and yet no visible Difference be found in the Persons as to Point of Health; and therefore I propose this as a Measure of a Thing not reduced to a Certainty, and in which therefore a great Latitude is to be allow'd.

The Blood is deriv'd from the *Chyle*, which having pass'd the Lacteals of the several Kinds, is deliver'd into the Blood at the

Subclavian, whence they pass together to the right Ventricle of the Heart, and there being yet more intimately mix'd, circulate thence forwards together through the whole Body, till after several Circulations and Depurations at the several Colatures or Strainers of the Body, they are (as the Chymists call it) cohobated or assimilated, so as to make one uniform compound Mass, which seems to be nothing else but *Chyle* alter'd by the Artifice of Nature, and exalted into Blood; for it does not appear that any Thing extraneous is mix'd with the Liquor circulating in the *Blood Vessels* but *Chyle*, except what was first separated from it for particular Uses, and what, after having serv'd them, it returned to it, unless perhaps it may receive some Portion of Air in the Lungs, which has been a Question much discuss'd *pro* and *con*, but not yet brought to any certain Decision by any Arguments that yet appear to have been produced on either Side the Question.

That there is a Quantity of Air mix'd with the Blood, and circulating along with it, is past Doubt; but whether any more than was at first contained in the Bodies out of which the *Chyle* was made, and was then transfitted along with it to the Blood, is a Question not yet decided: Nor perhaps is it easy to find Arguments that shall be demonstratively conclusive either Way; though if there were any Air introduced into the Blood by any other Passage than the *Lacteals* in the Manner already mentioned, it would be a Discovery of very great Importance; and that might tend to the Solution of many doubtful Problems in the Animal Oeconomy, if the Way and Method of its Entrance could be clearly demonstrated; but that not being done even for the Lungs, the most probable Way, we shall not presume so far as absolutely either to receive or reject the Opinion.

The Necessity of Respiration, and the florid Colour which the Blood receives in the Lungs, and first shews in the *Vena Pulmonaris*, are the Arguments which those who contend for the Admission of the Air into the Blood that Way insist most upon. For the first of them, we have already accounted in the Second Volume. The latter is chiefly supported by the Experiment of turn-

ing the grumous red Part of the Blood after Coagulation upon *Blood-letting*, by which it is observed, that the under Surface, which was before blackish, being turn'd up, and exposed to the Air, acquires a florid Colour, like that of the Blood in the *Vena Pulmonaris*; from whence they argue, that this Change wrought is in both Cases by the same Means, *viz.* by the Contact of the Air. But for this Change in the Lungs, those who oppose the Admission of the Air, pretend to account by the extraordinary Agitation of the Blood in the Lungs, which they think sufficient, by Comminution only, to impart the bright Colour.

There is an Experiment indeed which seems to favour the real Admission of Air, which is, that keeping the Lungs of a Sheep, or other Animal, in a pendulous or hanging Posture, if Water be poured into the *Trachea* till it be full, the Water will first insinuate it self into the Air Vessels, and thence return very freely through the Blood Vessels. This (says Dr. Drake) I have tried very often; but as I observed it would flow as freely from the Artery as the Vein, which, together with the Hydropical Distention of the Vessels themselves, render it suspected that the Continuity of those very tender Parts was broken by the Weight of the Water; and therefore he cautions not to lay too much Stress upon this Experiment, but propounds it only in order to farther less suspicious Trials.

But whencesoever derived, and how little soever it may be, this included Air is that which gives the expansive Motion or Spring to the Mass of Blood, and consequently is the Cause of the Incalescence or Warmth of it, which may thence easily be accounted for without having Recourse to *Acids* and *Alkalis*, or *Chymical Principles*; for Air, wheresoever included, is compress'd, as it must necessarily be in all Liquors, and will endeavour to expand it self, and consequently, if it be strong enough, drive outward the Parts of the Body that inclose it; by which Means it causes the Blood to beat against the Sides of the *Vessels*, which having *musculous contracting Coats*, do in their Turns compress it again, and so cause a *reciprocal Action* or Heat in the Blood greater than the meer circulatory Motion could; whence the

the Parts of the Solids or containing Vessels being put into a constant Agitation, as well as the Fluids, a Heat is produc'd in both, which they mutually impart to each other.

Besides this *Air*, the Blood consists of several Sorts of Parts, to some one or more of which, and their mutual Action upon one another, the intestine Motion of the Blood has hitherto generally been imputed. Those which upon the *Analysis* offer themselves to our View, are two Sorts, as Salts, a Quantity of Oil; which by some nice *Examiners* have likewise been found to be of two Sorts, a great deal of Flegm or Water, a good Quantity of *Caput mortuum*; which, however simple it may appear, may, for ought we know, consist of divers Substances essentially distinct from one another; but for Want of sufficient Ways of *Probation*, all that we get out of it, is a little fixed Salt by *Incineration*.

The *Chymists*, according to their wonted Method and Principles, account for the Colour of the Blood from the Exaltation of its *Sulphur*, which, whether true or false, is *gratius dictum*, and altogether as unsatisfactory as it is arbitrary. However, since the Doctrine of Colours in general is not applicable to Medicinal Use, it is not an Inquiry very necessary to be prosecuted in an Anatomical Work. However, that accurate sagacious Inquirer *Alphonsus Borellus* not satisfied with such wide *vague* Ideas of Natural Causes, thought fit to examine the Ground or *Materia substrata* of the Redness of the Blood by a Method more simple, and (I think) in such Cases more likely to succeed than the Chymical, which destroys the *Concrete*, and with a new Texture introduces Appearances. He took a Parcel of the *Crassamentum*, after it had separated it self from the *Serum* as far as spontaneously it would, and washing it frequently in Water, found, that by that Way it was separable into a viscous slippery Substance, consisting of white or colourless Fibres, which rises to the Surface of the Water, and there gathers into a Skin or coherent Pellicle of a Reticular or Net-like Texture, and deep red Powder, which precipitated pretty plentifully to the Bottom.

This Experiment shews, that the red Colour of the Blood is imparted to the Blood

by particular *tinging Particles*, as in the common Experiments of *Dyers*, tho' not so inseparably as many of theirs, most of which they know however very well how to *discharge*. It might therefore be very well worth that Man's while, who will reason about the Colour of the Blood from the *Hypothetical Principles* of the Chymists, to examine the Red precipitate apart, and so with which of their Elements it most abounds, which might perhaps teach them to be more wary in pronouncing about the Original of Colours. This fine red Colour, however generally found in the Blood of terrestrious Animals, and most others, is not absolutely necessary or essential to it; for besides that divers whole *Species* have their circulating Liquor *white or limpid*, which I should not scruple to call *Blood*, I have seen Blood (says Dr. Drake) let out to the Quantity of a Pint or more, from the *Median* of a Man, which was all of a pure *Milk White*, which did not, when cold, separate into a *Crassamentum*, as the Red usually does, nor yield a Skin or Cream, nor turn sour upon keeping, as Milk does, which to Appearance it very much resembled, but remained sweet without parting Substances for some Weeks, and at last corrupted and stunk, after almost three Months that I kept it fluid in a Viol, and then a very slight Separation ensued of the whiter Part from a *Whye-coloured Liquor*; but neither was the *Coagulum* near so strong as that of *sour Milk*, nor the Liquor so transparent as *Serum* or *Whye*, nor either in Smell or Taste inclined to be sour, but had at last a Smell pretty strong of Putrefaction. The Man from whom it was drawn, was lightly *Cachectical*, and both his Looks and Complaints were like Maids not very far gone in a *Chlorosis*.

Divers other Instances are to be found in Authors, of Blood that was not Red; and Dr. Lower, in his Book *De Corde*, relates a remarkable Case of one that bled so long at the Nose, that at last the Broth which he drank for his Supper flow'd little alter'd the same Way, as Blood: But that Case of the White Blood above recited, being the most compleat in its kind; for there was a Change made without any accidental Circumstances of Force, or the Attendance of any extraordinary Inconveniencies, which was in a

Manner habitual, and did not probably come upon the Man in an Instant, or a short Time, nor vanish so; but in all Appearance had its leisurely Steps and Gradations; during part at least of which Time a Man must live, and do all the Offices of Life; which he seem'd to do in the main as well as others, especially as such to whom we have above compar'd his State, without what is vulgarly call'd Blood. It is propos'd more at large, That they who trouble themselves to reason about the essential Qualities of Blood, may at Leisure consider wherein the Defect lay.

The Chymists perhaps will readily tell us, That Blood is a Liquor more *Sulphureous* than *Milk*, and that in this *Blood* which resembled *Milk* so much, the *Sulphur* was not sufficiently exalted to give the *Red Tincture*, which they derive from that Principle. On the other Hand, they who fetch the Colour from the Impregnation of the *Air* in the *Lungs*, may fancy a Defect or Obstruction of the Passage of the *Air* into the Blood in that Part, by which Means it was defrauded of that Colour or Spirituosity, which otherwise I should have had. Either of these Opinions may be true, but they are both improv'd, and therefore neither to be insisted on. But there is another Difficulty; which is, That this *White Blood*, after it had been let out from the Vein, above the usual Time of Separation, either in *Blood* or *Milk*, did not yet follow the Course of either, but still preserv'd its Mixture, without parting into a *Craassamentum* and *Serum*, or into a *Coagulum* and *Whey*.

Here the Chymists have a fair Opportunity to pretend to *Libration* or equal Temperature of their *Salts*, and to say that the Proportion of 'em was such, that the *Alkalions* hindered the *Acid* from procuring a *Coagulum*, and the *Acid* prevented a speedy Corruption from the volatile *Alkalions*, and so betwixt them preserv'd the State that it appear'd in at the first letting out, longer than is usual in Liquors, that have had their due Exaltation. On the other Hand, they that hold the Mixture of Air with the Blood in the *Lungs*, may at least with equal Reason say, That this Blood, not having received in the *Lungs* a Quantity of Air sufficient for its Perfection and Colour, con-

tinued yet enough to maintain it in the State of *Fluidity*, though not sufficient to bring it speedily to Putrefaction; which however it did at last, after an unusual Length of Time: But this is left to further Enquiry.

To return to the History of laudable well constituted *Blood*: The visible Elements of it are those which the *Laboratories* of the *Chymists* produce separate, though perhaps much alter'd by the Furnace; for it is past all Controversy that the *Empyreumatical Oils* drawn from the Blood by Fire, differ *totò Calo* from the natural Fat, or Oil, which circulates with the *Blood*: Nor is it improbable that the *Salts* raised from *Blood*, or other Animal *Liquors*, are in the Operation very much acuated; or at least, that the various Combinations of them, by which they were circulated in the *Blood*, are so destroyed as to render them quite a different Thing from what they were in the natural State. It may likewise be a reasonable Doubt, whether the Earth, or *Caput Mortuum* which remains in the Retort after the Distillation ended, be not a new Production, which had no Existence under any Form resembling that in the Blood it self; and it is probable that it is the Result of the heavier *Salts* and *Oils*, which being destitute of their more fluid Parts, are in a manner torrified in the Process, and put on a *Shape*, Consistence and Rigidity, which naturally they never had. But this latter Doubt I would not extend too far, because the Nourishment of the Bones seems necessarily to require something more solid than Oil, and less fluxil than Salt, which may serve to give a Consistence and Temper to those Two, of which the Bones by their *Analysis* are found mainly to consist.

From those Principles or Elements variously combin'd and distributed by the *Circulatory Motion* impress'd by the Heart, as has been already shewn in the Second Volume, and by the *Oscillatory expansive* Notion of the interspers'd Air, and the Reaction and Restitution of the contractile Vessels through which it passes, flow all the Properties and Operations of the Blood. From this Mixture of Elements, and their lax Composition, it is susceptible of various Alterations and Impressions, of which the Principal are

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Coagulation, which almost constantly attends the Parts of it, when out of the Body; but if generally within the Body, it must be mortal instantaneously, and therefore such a State of the Blood does not appear ever to have happened without artificial Procurement. *Dissolution*, which is an Affection just contrary to the former, and is such a Comminution of the Fibrous Parts of the Blood, as it indisposes it for that Separation of the *Crassamentum* from the *serous Part*, which always ensues in Healthy Blood upon cooling out of the Body, if received into a deep Vessel; for upon a plain Surface it will not separate. This Dissolution, or broken Texture of the Blood, is often the Consequence of *Malignant* and *Pestilential Fevers*, and shows it self in the *Petechiæ*, or *Purple Spots*; and in many of these Cases, the Blood taken away by *Phlebotomy* will not separate into a *Crassamentum* and *serous Part*. This Sort of Dissolution is likewise occasion'd by some Kinds of *Poisons*; among which may be reckon'd, the Bites of Venemous Animals; as *Rattle-Snakes*, *Vipers*, &c. In some of which however, the Dissolution is not Total, but Partial, and therefore overcome by proper Applications. Those Two contrary Affections of the Blood, when they spring from an *Internal Cause*, arise from the opposite Kinds of *Salts*, *Acids*, and *Volatile Alkalies*. For though in an Humane Body no sincere *Air* is to be found, nor could it indeed be consistent with Life; yet it may, and does often enter the Blood so compounded, as to bridle the *Volatile Alkalions*, which is the true Salt of the Blood, and so hinder the due Attenuation and Mixture of the several Parts; as in the Case of a *Diabetes*, and perhaps, in a *Chlorosis*, where the Blood is thick and torpid. On the other Hand, where the *Alkalions* are too redundant, and unbridled or exalted, the Blood is render'd too thin and fluid; so that the Discrimination of its consistent Parts is lost, according to the several Degrees of which, follow *Hypermenstruations*, *Purple Spots*, *Bloody Urine*, *Sweat*, &c.

Another *Disaffection*, which is very frequent in the Blood, is a too great Abundance of *Oils* or *Salt Particles*; by Means of which, the active Parts of the Blood being too much clogg'd, the Faculties of the Body are

not so vigorously exerted, and those Parts which should be separated from the Blood for the peculiar Uses are intangled and detain'd, whereby the Ends for which they are occasion'd by Nature to be separated are not sufficiently answer'd; and perhaps, which may be done of the least Inconveniencies of an *over-oily Blood*: The solid Parts through and by which it passes, are too much lubricated and suppl'd, and the Tone of them thereby vitiated; and consequently their Spring relax'd, and their Action impair'd; from hence proceed that *sluggish Inactivity* and *Drowsiness* which generally attend very fat People; whose *Nerves*, *Membranes*, and other *Tense Parts*, are relax'd by the too great Quantity of Fat with which the Blood abounds.

The contrary Affection to this is, the Defect of Oil in the Blood; which being as it were its *Balsam Lines*, and preserves all the Parts from being fretted and corroded by the *Salts*; whose *Spicula* or Edges are engag'd, and as it were, sheath'd in this soft *Balsamick Matter*, and so kept from attending the solid Parts, as they constantly do where this is wanting. This *Dyscrasy* of the Blood is usually attended with a general *Atrophy*, and a fretting or corroding of some particular Parts; whence arise *serous Desfluxions*, *Apoftemations* and *Ulcers*, &c. to which all Parts of the Body are liable in such a State of the Blood, especially the *Lungs*, whose tender *Vesiculous Substance* is more easily annoy'd than any other, by the *Acrimony* of the *Salt Serum*; whenever this happens, if it be not speedily corrected, a *Phthisick* soon follows, in the *Acme* of which the *Lungs* become ulcerated.

These are the principal *Dyscrasies* or Disaffections of the Blood, relating to its Temperature and due Mixture; for as to its Terrestrial Part, or *Element of Earth*, the Excesses or Defects of that are not so notorious, and consequently the Proportion which it holds to the rest is not so easily to be discovered and adjust'd, unless perhaps the *Creaceous Tophi*, and *Calculous Concretions* so frequently found in Animal Bodies, may be said to be the Product of a Redundance of Earth in the Blood: But if that be so, this *Dyscrasy* does not shew it self very apparently in the Blood, by any Thing but its Effects,

Effects, neither does it afford any clear *Indications*. For those that in these Cases *Physicians* have been able to find, are generally drawn from the Excess and Kinds of the *Salts*, which are always combin'd in great Quantity in this sort of *Concretions*; and all the Scope that they rationally drive at from their *Preservative* or *Curative Indications*, is to prevent those *Coagulations*, of which they look upon the *Salts* to be the Cause, or to dissolve them, when but loosely form'd. For whatever, farther some may pretend to in these Cases, is but the vain Boastings of *Charletuns* and *Empiricks*, who cheat the People with their Pretences to infallible *Dissolvents*, of firmly compacted *Stones*, which they impudently pretend to have done, whenever by the ordinary Means disguised, they happen to drive out any loose unknit Gravel, or small *Stones*.

All the other *Dyscrasies* of the Blood discover themselves readily enough to the *Eye*, the *Touch*, or the *Tast*, of a diligent, judicious Inquirer. But this only betrays it self none of these Ways, and is to be found out by Reasoning, and Consequences drawn from Hypothetical Causes; in which we may easily be deceiv'd, though there be a Necessity sometimes of using them. We can easily see whether the Blood be of greater or less Consistence than in a State of Health it ought to be; we can see and feel whether it abounds with *Serosities*, or Oil; and we can tast, or ever feel the *Asperities* of the *Salts*: The *Earth* only, which is esteem'd the grossest of all the *Hypostatical Elements*, eludes all these Trials, and leaves us to find it in its Effects.

However, as the Excesses and Defects of the other *Elements* are the most discoverable, so are they likewise the most important; and by their various Combinations and Complications, produce most of the Diseases of the Distempers of the Body, and therefore the Constitution of the *Blood* should upon all Occasions of *Phlebotomy* be nicely inquired into with more Curiosity and Exactness than I doubt Physicians generally use; who ordinarily content themselves with a superficial View, or perhaps a slight Tast with the End of the Finger; whereas they ought in many Cases to feel carefully, and examine by their Touch the Degree of

Cohæson and *Tenacity* in the Grumous Part after Separation, as well as the Smoothness and Oleosity of both Parts: And if they did by frequent weighing a Stated Measure examine the Specifick Gravity of *Morbid* in different Cases, and of sound Blood, likewise they might perhaps arrive at a Standard of the Quantity of Air contain'd in them, and thereby discover when the Disease proceeded from an Excess or Defect of Air incorporated in it. It is certain that the light loose Observations made upon Blood by our *Surgeons*, and *Blood-letting Apothecaries*, are very superficial and unsatisfactory; and the Judgments that they make upon them generally erroneous and false, for minding only the *Superficies* and Colour of the Blood, or perhaps the appearing Quantity of *Serum* in it, they roundly pronounce it Good or Bad, Rich or Poor, without minding any other Circumstances. Thus if the Colour be florid or gay, they readily commend it for good Blood, although perhaps it be *Hypochondriacal* or *Flatulent*, or have in it the Rudiments and Tokens of an *Incipient Inflammation*; in both which Cases the Blood will be very florid, because the Texture of it is pretty loose and broken. But having heard there were such Things in the Blood as *Red Globules*, from which indeed the *French Physicians* and *Philosophers* have, upon the Score of the Figure, generally derived the Redness of the Blood, tho' according to the Doctrine of that incomparable *Mathematician* and *Philosopher*, Sir *Isaac Newton*, Red being the Colour least *Refrangible* and least *Refracted*, the *Globular Figure* is of all others the least apt to produce that Colour, as being the most *Refrangible*; they conclude the Globules of the Blood safe and entire, and consequently all else well on the other Hand: When they see the *fizy Pellicle*, they presently cry out of *Acidity*, which causes, in their Opinion, that stiff *Coagulum*; whereas it is the Product of the direct contrary, and is only a Mixture of the *Aqueous* and *Oily Part* of the Blood, by Means of too much *Volatile Salt*; which, by an Intense Heat, are inseparably incorporated, as appears by the stiff *Fellies* produced in the *Philosophical Digestor*; which both in Colour, Consistence and Tenacity, resembles the *fizy Skin*, which by its Appearance

pearance always on the Surface, shews it self to consist of the highest Parts of the *Blood*. The visible Changes that happened beyond these are generally Matter of Surprise, and not Instruction to them, and are usually the Objects of their Wonder, not Judgment; which it is not to our present Purpose to prosecute here, it being sufficient to have given a *Hint* to the Judicious Inquirer, who we pretend not so much to inform as to excite.

There are other Disorders in the *Blood*, which do not originally spring from any *dyscrasy* or undue Mixture of its *Elements*, but from an Alteration in the *Motion*; such as an *Augmentation* or *Diminution* of the Degree of *Velocity* in the *Progressive* Motion, or the same Changes in the Degree of the *Expansive*, by which supernatural *Fermentations* are induced, or the necessary ones damp'd and check'd, and the *Progress* of the *Blood* too much hurried or retarded, which depend upon various Causes, very different from one another: As sometimes on Matters taken in *ab extra*, as in *Fevers* and other Disorders occasion'd by *Surfeits*, *Debauches*, or *Drugs*; sometimes by too violent *Exercise*, or *catching Colds*: At other Times, by some latent Malignity, or Indisposition of the *Air*; from whence proceed Epidemical Diseases, and very often by some vicious peccant Humours generated in the Body it self, and reassumed into the *Blood*; which are too many to be enumerated here, without entering into a Detail of almost all the Diseases of the *Blood*. In this Sort of Disorders the Spirits are too often accused, which is so convenient a Shift, and so fitted to be used on all Occasions, that it is grown almost the common *Ashylum* of all Baffled Reasoners; who, when they are puzzled, need do no more than lay the Fault upon the *Spirits*, and the Difficulty is over without any Trouble, for they are always at Hand to bear the Blame: But this is explaining *Obscurum per Obscurius*, till some Body or other gives us better Demonstration of their Existence, Nature and Operations, than our Ignorance and Want of something to fill their Place, and stop a Gap in our Philosophy, have done.

The *Solids* likewise have their Share in the disorderly Motions of the *Blood*; for accord-

ing as the Tone of the respective Parts thro' which the *Fluids* pass is *over-tense*, or too *lax*, the Motion of the Humours will be promoted or retarded thereby. For in cases of *Overtension* of the *Vessels*, the Pressure of the *Fluids* will, by the *Resistion* or *Elastick* Return of their *Parietes*, be reverberated with greater Strength, and consequently a greater Motion will thereby be impress'd upon them, and the Celerity of it encreased in proportion. But in a Relaxation or *Atonia* of the same Vessels, the Expansion of the *Fluids*, towards which they have a perpetual Tendency from Causes already mentioned, will necessarily be greater from the yielding of the Vessels, but the Progressive will lose some of its Celerity, for want of the Repercussion of their Sides upon the *Fluids*, as it does in the Veins; which Resolution of the *Tone* of the *Solids* may be one Cause of those Symptoms which constantly attend *Epilepsies*, and other *Spasmodic* Distempers.

The *Blood* thus variously compounded and circumstantiated, visits even the minutest Part of the Body by Means of the circulative Motion; of the Impulse and Causes of which, and the Passages through which it is perform'd, an Account has been already given, which needs no Repetition here. In this Round, those Particles of the *Blood* which conform best to the Figure and Structure of the Parts through which they pass, are apposited to them, either for their Augmentation, which is call'd *Accretion*, or for the Reparation of such, as by the Constancy and Rapidity of the Circulatory Motion of the *Blood* must needs be worn off from them.

About the Matter from whence this Nourishment is derived, great Contests have arisen amongst *Physicians* and *Anatomists*, in which this only has been a Point agreed upon by common Consent; That amongst the various Humours of the Body, there was one peculiar destined and contrived for that Office, but which that is has been the Dispute. In which they seem to have shewn more Reading, Learning and Subtilty, than true understanding of the Point in Question. Some have contended for a Nutricious *Juice* to be convey'd through the Nerves, in which some great Men of our own Country have

been the Principal Misleaders. Some have set up the *Lympha*; others, the *Chyle*, as the *Universal Succus Alibilis*. Some have appointed the *Serum* or *Albumen* of the *Blood*, which is nothing else but the *Lympha*, for that Office, which others assign to the *Craffamentum*. And there are some, who out of several Elementary Parts of each, or all these, make various Combinations, according to their own Fancies; from whence they have form'd an almost innumerable Variety of *Hypotheses*: All of them carrying seeming Probability, yet none of Conviction; at least not to me. The Reason of this Miscarriage of so many great Wits, seems not to be any Want in them of Qualifications sufficient for such Inquiries, but that the Matter is in its own Nature not precisely determinable.

However, all these, except they who bring a Nutritious *Juice* through the Nerves, agree that the *Blood* is the Vehicle that conveys the *Alimentary Parts* through all the Body, whatsoever they may be, and whence-soever derived. But perhaps upon the Score of its *Heterogeneity*, or Composition of different *Elements*, they did not make that it self the *Nutritious Fluid* without restraining the Faculty of Nourishing to some particular Parts of it; as thinking the general Account too *vague* and indefinite. I must confess, says the ingenious *Drake*, I think all those precise Determinations to be too narrow and restrain'd, and that the *Blood* in its largest Acceptation, including all those Parts which have been before described as belonging to it, is simple and homogeneous enough for the Purpose of *Nutrition*: He conceives therefore, that all the superficially different Parts, be they more or fewer than those we have already describ'd, which circulate together in the Vessels under the common Name of *Blood*, do contribute something either instrumentally or materially to the Augmentation or Reparation of the Parts through which they pass: But how much each precisely for his Share does separately contribute, he does not pretend to know, or affirm; that the Liquor which we call *Blood* consists precisely and exactly of so many *Elements*, or Parts Simple in relation to Sense, and our *Analysis* of it, and exactly no more.

Therefore, before we proceed to lay down this Author's Notion of *Nutrition*, it will be necessary to say something concerning *Sanguification*, another Point which has been very much canvassed among the Learned, but with as little Fruit and Satisfaction as the former: We shall not therefore trouble the Reader with the Discussion of such barren and useless *Questions*, as whether the *Liver*, the *Heart* or the *Blood*, &c. *sanguify*, which serve rather to try the Wit and Invention of young Students, than to inform their Judgments. By *Sanguification*, is generally understood the *Assimilation* of the *Chyle* into *Blood*, which is supposed to be complete, when the whole circulating Mass is saturated with a high *Red Colour*, and upon *Phlebotomy* separates in the Basin into a *Red Craffamentum*, and an *Amber-colour'd Serum* only, without any *White Matter* floating loose on the Surface, as the *Chyle* before perfect *Assimilation* will do.

The Physicians of the last Age, upon the Introduction and Reception of *Chymistry*, suspecting almost every Thing to be done by *Ferments*, and among the rest *Sanguification*, were therefore very Solicitous to circumscribe and fix it to the proper *Officina*, where they supposed this *Ferment* was prepared, or at least to be found; and great Disputes there were among them about it. Hence the *Liver* and the *Spleen* had sometimes their *Triumphs*, sometimes their *Obsequies* sang, as a fresh Champion or Adversary arose for or against their Cause: But conceiving the Notion of such Sort of *Ferments* are almost destroy'd, we shall not trouble the Reader here with them, till we come to treat of Fermentation and Digestion distinctly; neither shall we disturb the Ashes of the *Plastick Powers* and *Faculties* of the Ancients, long since deceased, since no Body is in Danger of reviving these Doctrines again with any Prospect of Success.

Of *Sanguification*, we may admit Two Degrees: The First of which amounts to no more than a *Confusion*, or such an intimate Mixture of Parts, as suffices so to confound the different Colour of Liquors, as that the Whiteness of the *Chyle* shall be so lost, or drown'd in the Red Colour of the *Blood*, as never more to appear again in its own Shape and Colour; to which how many *Circulations*

tions are necessary it is hard to determine : However, he that considers the several Motions as well *intestine* as *progressive*, will easily allow them sufficient to produce such a Mixture in no long Time.

The Second Degree of *Sanguification* is, when the Parts of the *Chyle* are so exalted or communicated, and subtiliz'd, as to lose intirely the former Tendency to a *Coagulatory Separation*, such as in *Chyle* and *Milk* they have in the spontaneous Separation, or curdling of which latter there is a Concurrence of a manifest *Acid*, which in the Separation of the Parts of Blood is never found, nor even in the most *Morbid* Case.

We have mention'd but Two Stages or Degrees of *Sanguification* ; one while the Mixture is gross and consider'd only, and the other when the Parts are communicated and united, which seems to give us a sufficient Idea of perfect *Blood*, though there may be, and undoubtedly are, several Steps or Degrees between these, which we neither need nor indeed are distinguish'd by any sufficient Tokens, for want of knowing how many Circulations are necessary to make a perceptible Alteration in the aggregate Mass. However, there is a farther Degree, in which the Parts are yet more exalted and subtiliz'd ; but this being beyond what is Salutory, I account the *Sanguification* perfect without it. This latter is that State in which the Fibres and Filaments of the *Blood* are so broken and blended with the Aqueous Parts, as not to be again separable from them, which therefore may be esteem'd a *Morbid Sanguification*, such as happens in *Pestilential* and other *Fevers* ; which are attended with *Bloody Sweat*, *Urine*, *Spots*, &c. and in which the *Blood* will not separate when cool, tho' out of the Body.

All these Degrees, whether imperfect, perfect or *Morbid*, are procured by reiterated Circulations, in which as well the *Intestine* as *Progressive* Motion conspires to the effecting the Mixture and Comminution of the Adventitious Parts, and undoubtedly have their stated Period, in which they arrive at Perfection, though where precisely to fix that, is unknown to us ; but that it is so is plain, by the Crudity of the *Chyle*, which may be found by letting *Blood* after a full Meal, in which the *Chyle* will appear distinct

after many repeated Circulations, and by the too great *Fluidity* or over-intimate Mixture which appears in that State, which we call the *Morbid Sanguification* ; in which there is undoubtedly the concurrence of some collateral Cause, besides the natural Motions of the *Blood*, because it is found in some peculiar Distempers only, though there may be many Degrees of Excess of Exaltation beyond the due State before it arrives at that inseparable Pitch of *Fluidity*, which manifests it self plainly to us ; but being unheeded, and perhaps not cognizable by any visible Token, we cannot account distinctly for them. It would indeed be of very great Service towards the Cure of Distempers, if such adequate Trials could be invented as might discover the several Gradations towards or beyond *salutary Sanguification* : But these being yet unvented, must be left to future Industry and Sagacity.

By this Account of *Sanguification*, however rude and unaccurate, it will be obvious to any considering Person, that the same Difficulties that occur in settling the distinct Steps of *Sanguification*, are to be met with in *Nutrition* also : For whatever the *Nutritious Particles* may be, it is plain that from the first Admission of the *Chyle* into the *Blood*, their Motion is confounded with the Motion of the *Blood*, and conformable to it, and consequently that no distinct Account can be given.

Whatsoever Notions therefore Speculative Men may advance about the distinct and gradual Motions of the *Nutritious Matter*, and whatsoever Distributions they are pleased to make of this Sort of Matter to one Part, and that to another, they exist in Imagination : For as the nutritious Juice or Juices are mix'd, and circulate with the *Blood* through all the Parts of the Body, all that we can distinctly conceive of them is, that as the Excrementitious Parts are in their Passage separated into specifically distinct *Fluids*, by Means of Glands, whose Pores are adapted to receive such Particles only as when they come together make such a peculiar Species of *Fluid* as the *Urine*, which is separated by the *Kidneys*, the *Bile* by the *Liver*, and the *Saliva* by the Glands about the Mouth, &c. So we may conclude without offering Violence to Reason, or straining

ing Inferences, that the Pores of the Parts to be nourish'd are so figur'd and form'd as to retain those peculiar Particles which conform best to them. But we cannot with any Foundation pretend to tell what sort of Particles each Part retains, unless we knew distinctly likewise how the Pores of those Parts were dispos'd, and could tell precisely what Parts they were capable of receiving, and what only; which is a Degree of Knowledge we may doubt whether any Man has ever yet arriv'd at.

The *Analysis* of the Parts do indeed give us some grois *Idea* of the Materials whereof they were compounded, if we suppose that the Bodies which we separate pre-existed in the Body; which are comparatively so very soft, should endure so constant and so violent a Flux of Humours without Decay. In *young Bodies*, where the Vessels are much tenderer, not only the Sides are ampli'd by this expansive Motion, and their Dimensions that Way encreas'd, by receiving more than they lose, but by the *Progressive Motion* which naturally and strongly pushes forward, and would not return but for the Bar and Check which they receive at the Extremities of the Vessels, the containing Parts are gradually stretch'd out in Length, and by the Matter which insinuates it self every where into the Pores, are hindered from returning exactly to their first Dimensions, by which Means they insensibly vegetate or grow; which they continue to do, till the supporting Parts, the Bones, growing by Degrees rigid and firm, admit of no farther Extension, and thereby put a stop to the farther Growth of the more flexible and yielding Parts, which are tied to and limited by them.

Thus the *Dimensions* of the Body, as to *Length*, are circumscrib'd to that precise *Stature* which it had at the Time when the Bones first acquir'd that unyielding Rigidity. And these Dimensions every Limb maintains during the rest of Life, unless by Accident a Bone be broken, or by any Distemper softned again and render'd pliant; in which Case the other Parts follow the Figure and Dimension of the Bone. As when it happens that the fractured Parts of a broken Bone are not rightiy put together

again, as it often falls out in the Bone of the *Thigh*; where the under Part not being brought to correspond rightly with the upper, the Weight of the Body making the upper bear downwards, they slip along each other, and the *Leg* is thereby shortened. The same Thing happens without a Change of Dimension of the Bones themselves, if the Head of the *Thigh Bone* be turn'd out of its *Socket* in the *Ischium*; in which Case the Weight of the Body makes the Trunk bear downwards, and the Flesh yielding for the Head of the Bone to rise, the *Leg* appears shortened.

What it is that determines the yielding of the Bones to a stated Time, pretty nearly agreeing almost always in all Persons, is hard to tell. All that appears certain in it is, that this Rigidity of the Parts comes on gradually, and that from our first Conception to that Time, the Encrease is by Degrees less and less every Year; perhaps every Month, every Day, were we able to adjust our Observations so nicely as to calculate it. We may be sensible that many Times the Growth receives a Check from some contingent Circumstances, of which we are not aware, and returns again when they cease, though insensibly to us. In Diseases we are indeed aware of this sometimes, and think we know what to impute it to, tho' even that we cannot do precisely. But it is not the solid Parts only that are tenderer in *young Animals* than in growing ones, but the Fluids themselves are much more soft, and, as it were, grumous, as we find by that Juice which we call the *Gravy*, which the younger the Meat, the more *Gelatinous* it is.

These seems to shew, that from whatever *Element* they are deriv'd, or however compounded, the nutritious Parts are *Fibrous*, *Soft* and *Gelatinous*; and that consequently the less they are comminuted and subtiliz'd, the fitter they are for Nourishment. Hence it comes, that the Blood of Children having undergone few Circulations, in proportion to grown Persons, is in the same Proportion more nutritious, and the Parts which are form'd out of it more soft, flexible and yielding; which softens by length of Time and repeated Circulations, the *Fluids*, as well

well as Solids, gradually lose, till the latter resisting the Impulses of the Blood, a Stop is put to their Growth.

From hence also we may conclude, That *Bones* are form'd out of the most comminuted or broken Parts of the *Blood*, since we see that the *Blood* of old Men, which by a long Course of *Circulation*, becomes in a Manner unfit for the common Course of *Nutrition*, will however generate *Bones*, and convert into that sort of Substance many of the *Tendons* and *Ligaments*, and even the Coats of the Vessels themselves, whose Substance being next to the *Bones*, the most compact, admits only of the smallest Particles of the *Blood*, which therefore soonest become Oseous, as they are frequently found.

This *Theory* may furnish us with a reasonable Solution of that *Problem* which Dr. Sydenham propounds as unanswerable, and as an Argument against the Use of *Theory* in *Physick*, why a Horse or any other Animal arrives at his *Acme*, meaning his full Strength and Vigour, at a determinate Age; for tho' we cannot tell by what Proportions and Degrees this Softness, both of the Humours and solid Parts, wears off, yet we find that it gradually does so, and that all Sorts of Animals have a stated Period of Time in which the Circulations have reduced the Solids to such a State of Resistance, as to admit no longer of a Vegetative Encrease; and that gradually as this Vegetation declines, the Strength encreases, which depends upon the Resistance that the *Solids* make to the *Fluids*; in which consists the Strength of the *Muscles*. For the Action or Force of a *Muscle* consisting in the Resistance, which the *Muscular Fibres* make to the Effervescence of the *Blood*, or other *Fluid* included in the Belly of the *Muscle*, the Animal is then strongest, or in his greatest Vigour, when his *Muscles* are able to make the stoutest Resistance; which is, when they will no longer admit of a permanent Distention, that is, when they have done growing.

It may be objected, That the Resistance of the Vessels is yet greater in aged Persons, and that according to this *Theory* it must be so; which notwithstanding is attended with Stiffness, want of Strength, Vigour and Heat, which is confess'd. But these Things depending upon the mutual Action or Reaction of the *Fluids* and *Solids* upon each other, as the solid Parts grow stubborn and unyielding to the Impression of the *Fluids*, so they lose their Elasticity or Faculty of Resilition or Restitution, by which the Motion of the *Blood* it self was invigorated and promoted; and by this Rigidity of the Vessels the *Blood* is reduced to a meer *Circulatory Motion*, such as is impress'd by the Impulse of the Heart only, without any Room for the Expansive, upon which all the vital Actions depend, as much at least as upon the *Progressive*, though both be indispensably necessary.

But besides this Indisposition of the Vessels, which from the *Theory* laid down unavoidably attends Age, the Humours themselves by long Attenuation grow so much assimilated or homogeneous, that the Fermentation or necessary expansive Motion is but ill maintain'd; through which Defect, together with that of the Vessels, the Circulation it self languishes, and all the vital Faculties gradually decay with it, till if no Accident supervenes to hasten Death, which a little one in these Circumstances will do, Nature it self fails, and they drop like over-ripe Fruit, as it were spontaneously, and of Course into the Grave.

This *Theory*, as little able as we are to be precise and exact in it, will enable us to account for more *Phænomena*, and is capable of more Improvements than any drawn from particular Humours, without any Force upon Nature, and running into Suppositions, not warranted by the Mechanism of the Body. For if it be true, it suggests a Way of preserving our selves longer than ordinary, if regular and early Cure were taken: Of which we shall speak larger hereafter.

Of the Nature of Fluidity, how Fluids agree, and that Blood is like other Fluids ; with an Account of what is known of that Liquor. From Paxton's Specimen Physico-Medicum.

HAVING already observed (says the Author) what a Variety of *Fluids* are naturally contained in a Humane Body, before I descend to treat of them in particular, it may not be improper to premise somewhat of their Natures in general.

It is certain, the Fluidity of Substances is not founded in any Size or Shape of the constituent Particles, but purely and only in their continued Motion, by reason Bodies are not denominated *Fluids* from any Qualities, Powers or Operations, but from the continued Motion, and Want of Union of their Parts; for whensoever that Motion ceases, and the Particles unite or adhere, they lose their Denomination. This continued Motion of the Particles of a *Fluid* must naturally produce a Variety of Changes and Alterations in the Qualities of such *Fluids*, that consist of Particles different in Size, unlike in Figure, and unequal in Motion; because Particles that bear no Similitude to each other, promiscuously moving and roving, must necessarily, by reason of their Unlikeness, meet, strike, jostle and hinder each other; by which their Motions or Determinations being alter'd, the Positions and Habitues they bear to each other change, and of Consequence the Qualities, that are only the Effects of such Habitues and Positions. It is from this Reason that all the *Juices* express'd from Plants or Fruits, all strong Infusions, all new Worts or Beer, all Cyders, Perry, and new Wines, which plainly, even to the naked Eye, betray the Diversity of their Parts manifestly, altho' gradually, change all their Qualities; for from being turbid and opack, they become clear and transparent; from being sweet and nauseous, they grow pleasant and

delicious; from being flat and heavy, they arise to be light and spirituous. However, they evidently alter, although not always to the Pleasure and Advantage of our Senses, in all their Qualities.

Whereas *Fluids* consisting of *homogeneous* and uniform Parts, cannot undergo such Changes, by reason notwithstanding such Particles continually move and change Places, yet being equal and uniform, that Motion produces no sensible Variation in the Texture of the Liquor; and from hence it is, that the more uniform and homogeneous the Parts of a *Fluid* are, the longer it continues without a sensible Alteration in its Qualities, as may be observed in *Quicksilver*, in divers distilled *Oils*, *Waters*, *Spirits*, &c. in *Wines*, *Beers*, and other strong Liquors, after they are perfectly fined.

This Consideration of the intestine Motion of the Particles of all *Fluids*, will easily let us into the Mystery of that Action or Operation of Liquors that is termed their Fermentation; for that Term is used to denote some as yet unexplained Power, that is supposed to reside in some Liquors, by which they alter their Natures, and for the most part defalcate and refine themselves, which in Truth appears to be no more than what we in plain English call the *Working of the Liquor*; and all such Liquors that are experienced to have a Tendency to alter their Qualities, are termed *Fermentative Liquors*: But although the Word is orderly confined to signify such Liquors only as are daily observed to undergo Changes, viz. such as *Beer*, *Ale*, *Cyder*, some *Wines*, &c. yet it is plain, it may with equal Reason be extended to all Liquors that are not entirely *uniform* and *homogeneous*, by reason all such are prepared

pared to undergo the same or like Changes, although not being so much in Use, they are not so much observ'd; for that Action or Operation that in the above-recited we dignify with the Title of *Fermentation*, is not any Thing different or distinct from that Motion that is inseparable from the Particles of all *Fluids*, but is really that very Motion which only acquires this new Denomination when it becomes visible; for by the Means of this Motion, such Parts in Liquors that have the same Tendency, the same Size, the same Figure, must necessarily congregate and herd together, because they agree in every Thing; whilst others in the same Liquor, that are neither under the same Degrees of Motion, nor have the same Determinations, nor the like Magnitudes, nor Shapes, must as naturally be drove out and expelled, because they thus differ in every Thing: And as this intestine Motion in such heterogeneous Liquors is call'd their *Despumation*, so this Despumation, which is only the Separation or Expulsion of the gross, unlike and disagreeable Parts, always may be observed to succeed according to the different Degrees of Motion in the minute Parts of the Liquor.

Such *Fluids*, which, by reason of the Briskness of the Motion of their minute Parts, do usually (in no very long Time) refine or despumate themselves, do very frequently acquire a manifest Degree of Heat, which gradually vanishes as the Liquor fines, but may be continued by a frequent Affusion of fresh unrefined Liquor; and this Observation perhaps may yield us no improbable Hints for the natural Reason of the Continuance of that Warmth that is congenite to the Blood of Animals. However, waving that, I am inclined to think, from a due Consideration of the certain Nature of *Fluidity*, and from Observations made upon several particular Bodies, that there are but few Liquors but will sooner or later undergo some Change by the Means of this Motion, that is, but will throw off some Parts that are not precisely uniform, and thereby undergo Changes in their Qualities; I say not all, because *Quicksilver*, and some Bodies drawn by Distillation, seem to admit of an Exception. The purest Water will, if kept, plainly discover some dissimilar Particles

lurking in its Chryselline Bosom, which, before they can be entirely divorced, will so taint and stain that harmless and Virgin Liquor, as to make it loathsome to the Smell, and ungrateful to the Palate. It is true, these Changes in Liquors consisting of most uniform Parts, appear comparatively so very inconsiderable as to pass often unobserv'd.

It may perhaps be thought, that what I have here said of the general Nature of *Fluids* can be to little Purpose, since I have already declared, that the principal Design herein is to enquire into the Nature of Diseases, which can relate to such only that are contained in our own Bodies, which are widely different in most of their Qualities, not only from those I have instanced in, but from all others that exist without an animated Body; and especially when I have already proved, that we have no Means whereby to learn the Natures of particular Substances, but by applying our selves to such for our Information. To which I answer, That altho' I acknowledge we can have no Certainty of the Natures of Corporeal Beings without Revelation, but as we are taught from them who are only able to reveal their own Natures, yet Analogy in such Things that are without the Reach of our Senses, is the only Means we have to regulate our Guesses; and in the present Case, I have only us'd Instances for such Ends as merely respect that Part only of the Nature of *Fluids* which is common to all such as are seated in our Bodies, as well as such as are without it; for as to other Qualities, Powers, Efficacies, Actions or Operations, which are many and great, wherein there appears no Agreement, I pretend not by such so much as to illustrate.

But the better to explain what I mean, it will be convenient to remind my Reader, that there are always contained in the Body of Man common and appropriate Juices, and that of the first of these there are two Sorts, *viz. Blood*, and *Spirits*; and that the Blood is the Source, from whence not only all the appropriate Juices, but even the Spirits, are separated. In order then to shew that what hath been here said is applicable to what I design, it is incumbent upon me to prove, that the *Fluids* within us do in some Things agree with those without us; and that the Blood,

Blood, like some of them, is compounded and made up of very differing, dissimilar and unlike Parts, and therefore is naturally fermenting, that is, endeavouring, by the *intestine Motion* of its minute Parts, to purify and despumate it self; that is, the homogeneous and uniform Parts do naturally tend to congregate and come together, and by that repel and drive out the *heterogeneous* and unlike, which will appear several Ways.

First, In that it is daily made and continually supply'd by particular Substances we eat and drink, which partake of very different Qualities.

Secondly, By the great Variety of proper Juices separated from it.

Thirdly, By its yielding Nourishment, mediately or immediately, to so many unlike consistent Parts.

Fourthly, And certainly from the immediate Consideration of it, when drawn out of its own Vessels, and nakedly exposed to our Examination; for then it soon so far discloses its Nature, as to discover to the unassisted Eye, that it consists of Parts that are not uniform or homogeneous, by reason some of them readily part, and plainly disclose their unlike Qualities in different Colours and Consistencies.

And as the Blood is compounded of dissimilar Parts, so it is naturally warm, and this Heat may be increased by such Substances, as being received into the Stomach, do from thence pass into the Blood. I need not produce many Instances to confirm what every Man's Experience will teach him, that strong and vinous Liquors will warm; and as the Blood may be præternaturally heated by what we eat and drink, so it seems not altogether improbable, but that its natural Heat may be preserved that Way; and what seems to confirm this Conjecture, is, that its Heat by Abstinence is usually abated.

However, this is certain, as the Blood is compounded of very differing Parts, so it is always, by the Help of the *Secretory Vessels*, purging and purifying it self: For notwithstanding some of the Separations made from the Blood are really necessary to the Life of the Animal, as appears particularly evident

by the Secretion of Spirits made by the Brain; yet if we consider the Blood as a natural Substance, and so acting by the same Laws as other natural Beings do, we must conclude, that all such Separations do proceed from the Mechanical Affections of the Blood, and are therefore thrown out of the Mass by the Help of these Vessels, because they are not homogeneous to it; so that the Blood really fines and purifies it self, notwithstanding the Life of the Animal could not be continued, unless the Blood did make these Separations.

By these Observations, it appears that the Blood agrees with other *Fluids* of dissimilar Parts, in that, like some of them, it heats, and like all of them, it purges, purifies or fines it self; that is, that it naturally parts, separates or divides from some disagreeing Parts by Means of the *Secretory Vessels*. But in the Continuance and Manner of doing this, it differs extremely from other *Fluids*; for its Native Heat is as lasting as the Animal Life, although not always equal, and its Despumation is by the *Secretory Vessels*; because not being like other Liquors left to it self to proceed in its own Way, by reason it is perpetually whirled about by the *Circulatory Motion*, nor not being contained in Vessels capacious enough to fine it self, as they do, it can only perform it by these Vessels. As to what perhaps may be made an Objection by some, that Heat is not essential to Life, nor to the *Blood*, or at least to that *Juice* that is analogous to *Blood*, as appears by what we may observe in exanguine Creatures, seems to me to carry no Weight; for Heat, if consider'd as a sensible Quality, only bears a Relation to our Senses; but if consider'd Physically in the Subject, is only *Motion*; so that no *Fluid* can be absolutely cold, that is, depriv'd of all internal *Motion*. Besides, we may observe several Liquors to fine themselves; where there is no Perception of Heat, and where they are contained but in small Quality, it is seldom felt.

Health, (says the same Author) the more I consider it, the less I understand to define it, which brings into my Mind that Saying of one of the Fathers, although spoke upon a very different Occasion, *Si Nemo ex nequarar, scio; si Quarenti explicare velim, nescio*,

scio. Every one's own Experience will inform what Health is, and his Complaints will declare to others what it is not. Something it is that we always lament when we want, and yet do not value when we enjoy. In its Absence it is prized as the greatest of Blessings, valued as a Heaven here below, or an Earthly Paradise; without it even Life is condemned, and Death desired, because to live then is but Pain, and to move is but Misery.

Sickness or Diseases are but the Reverse to Health, and are only some unnatural Changes in the Body of Man; for when a Man is sick, diseased, disorder'd in Pain, or any Ways ill affected, it is certain he is alter'd and chang'd from what he was in Health, because he is not then as he was before; and all Changes and Alterations, whether in our own, or in other Bodies, if naturally performed, are by *Fluids*, by reason a consistent Body, as such, must unalterably remain in a settled State, unless it is alter'd or shelter'd by a *Fluid*.

But because there is a Variety of *Fluids* in a Humane Body, there may be some Difficulty to discover in which Diseases lodge, unless we first enquire into their Natures. It is certain, some Diseases are as diffusive as our Bodies, there being no Part that is exempt from their Tyranny; and such therefore require a Subject as extensive, and are therefore derived from one of the *common Fluids*; whilst others are of a narrower Compass, being limited to a particular Region, and so are either produced by some præternatural Separation deposited in such Part, or by some Fault in an appropriate Juice. However, since all Juices, whether natural or præternatural, are derived from the Blood, I shall treat of it, as being in Nature prior, before I examine into them.

But by reason the other *common Fluid*, the Spirits, seem to be diffused equally throughout the whole Man, there may be some Difficulty to discover from which of these two some of these general Diseases do proceed, unless we can first establish a *Criterion* whereby to distinguish between them. To do this, we must have Recourse to Experience and Observations, for it is from them only we can be inform'd; and by them we are plainly taught, that all *natural* and *præ-*

natural Separations, the Repair of all the *solid* and *consistent Parts*, all *natural* and *præternatural Heat*, are some Ways derived from, or appertain to, the Blood; and that the Spirits are the only Instruments of all *Sensation* and *Organical Motion*. These are Truths now so universally known, that I think it superfluous to go about prolixly to prove them; wherefore I shall briefly offer but these two general Observations: First, If the *Blood* be but hindered from passing into any particular Part, all those above-named Effects which I have observed to be derived from the *Blood*, will be there entirely destroy'd: And if the Passage of the Spirits into a Member is but intercepted, their proper Offices of *Sensation* and *Organical Motion* are immediately lost.

But first of the *Blood*, which hath been already shew'd to be compounded of different and unlike Parts, to be the Fountain from whence the other Juices are deriv'd, to have two Kinds of Motion, and to be contained in its own proper Vessels. It remains now that we enquire what further is to be known of the Nature and Uses of the *Blood* so long as it was in our Veins. It is very evident, so long as all the Parts of our Bodies regularly perform their several Offices, *Functions* and *Operations*, we enjoy an absolute and entire *Health*, *Health* being only a Term to signify the joint Performance of the Duty of every Part for the Benefit and Safety of the whole; for whensoever the *Uses* or *Functions* of the *Parts* are impair'd or injur'd, the Body is said to be *sick*; and whensoever entirely destroy'd, *dead*: And as all Parts of the Body conspire and cooperate in their several Ways for the Good of the whole, so any Part failing in its Duty, the whole suffers; however, the Part that is deficient, is only said to be diseased. But notwithstanding every Part of our Bodies hath its proper Use, yet all are not equally useful for continuing Life to the whole. The *Blood* is a Part so entirely useful, that Life cannot be continued without it, and whensoever this necessary Portion of our Bodies alters and fails in its Offices, our Healths immediately impair. But notwithstanding the Health of our Bodies thus suffers by the Fault of the *Blood*, yet that Faultiness appears only to us by the Means of its Functions and Uses:

When-

whensoever then the *Blood* rightly performs all its Offices, it is certain the *Blood* then is good, because the Man is well, the Goodness of the *Blood* being only a Relation to the Health of the Man. This Consideration, methinks, alone shews the Vanity of that Usage of judging of the Purity or Goodness of the *Blood*, by its Colour, Taste or Consistency, after Venesection, because then the Relation between that *Blood* and the Man is ceased: For notwithstanding we may judge of the Goodness of the *Blood* by the Health of the Man, yet we cannot of the Health of the Man, by the Means of his detracted *Blood*.

The Diseases of the *Blood* appear by the Vices and Faults of its *Functions*, *Uses* and *Operations*; for the *Blood* it self is contain'd and included in its own proper Vessels, and they are buried and cover'd with the common Teguments of the Body; so that these Vessels and Coverings interposing, exclude us from any immediate Knowledge of this *Fluid*, so long as it is thus contain'd, unless what can be communicated by the Means of such Vessels and Coverings, which can be but small, by reason such interposing *Parts* are cross'd and opacous, and are only subject to the Examination of one *Sense*, viz. That of *Touching* and *Feeling*; wherefore all the Knowledge we can obtain, of the State or Qualities of the *Blood*, during its Continuance in our Veins, only extend to such Things as are discoverable by this *Sense*; and that can only relate to the Two differing Motions of the *Blood*, the one of which discern'd by the Pulse, the other by the Heat; for it is evident there is nothing else, whilst it is in our Bodies, that can directly fall under our Examination. And in the due observing, considering, weighing and comparing these Two Things, viz. *The Motions of the Blood, discover'd by our Fingers, and its Separations by our other Faculties*; how they are in that State we call Natural and Healthful, with how they are in an unnatural and unhealthy one, with the several Circumstances attending these, consists all the Knowledge we can have of the *Blood*, and all the Changes and Diseases seated there.

But here perhaps it may not be improper to obviate an Objection that may be made,

viz. That although it hath been prov'd, that there is a *Motion* amongst the minute Parts of a *Fluid*, and that there is such an one in the *Blood* it self, after the *Circulation* is ceased, and that therefore it is reasonable to conclude, that there is such an one during the *Circulation*, yet that hath not been particularly prov'd. To remove then all Pretences to such an Objection, I shall directly shew there is such a Motion Three several Ways:

First, By its Heat.

Secondly, By its Inequality in Separation.

And *Thirdly*, and more immediately, from the Consideration of it when flowing out of its own Vessels, and received into another.

It is certain, our *Blood*, whilst it runs in our Veins, is always warm, and it is as certain that Heat is only Motion; Bodies being hot or cold, as their Particles are more or less moved, and the *Blood* being warm, its Particles must therefore be in Motion. By the Second it is evident, because the ordinary Secretions neither regularly answer to the Quantities or Qualities of what we eat or drink, nor to the Degrees of Motion in the Circulation, and therefore cannot directly depend upon either; and if therefore not upon these, they naturally must upon some Motion of the Parts, because no Alterations can be conceived in a natural Substance, but by some Motion. By the Third, this Motion appears even *ad Oculum*; because in Emission it streams out in divided Parts, and the uniform and homogeneous run together, which they could not do without Motion; and this Motion either must have been antecedently in them, or must have been acquir'd by their Emission; but it could not be the last, because by that they lose their Motion, in that they grow cold, and therefore must have been in them while running in our Veins.

These Observations make it manifest, that there is *de facto* amongst the Parts of the *Blood*, different and distinct from that of the *Circulation*. These Things thus premised, it will follow, so long as the *Blood* in Circulation is whirl'd about in its proper Conduits, by an equal and natural Motion to

all Parts of the whole Body ; and so long as it is by a gentle and easy Agitation of its minute Parts, so disposed to supply the several Vessels adapted for Separation, with their particular Juices, and all others with Nourishment. So long the Secretary Vessels will perform their Offices, and the solid Parts will be repair'd : And so long as these are thus regularly perform'd, so long it is apprehended there can be no discernable Alterations in the *Blood*, and of Consequence no Disease to be observ'd there.

The *Blood* I conceive then hath been already prov'd a *Fluid* compounded of very different and unlike Parts ; that it is constantly moving, hourly separating, and daily receiving fresh Supplies ; but as to any of its Properties, Powers, secondary or sensible Qualities, it being so included in the consistent Organical Parts, that it cannot immediately operate upon us ; we must, as I suppose, without Revelation for ever remain in settled Ignorance. But there being several Symptoms complained of in the Body of Man, that seem to be deriv'd from some Change in the *Blood*, which cannot be discover'd by either of the Two formerly mentioned Ways, I mean its *Motions* or its *Separations*, it will behove me to examine what they are, or how they can be effected ; for these consisting in such Affections as are not outwardly to be discover'd by us, can be only learnt from the Information of the Diseased ; and may be comprehended under what we call either Pains, Sicknes, Uneasiness, Faintings or Weakness, and their several Degrees : These I take to be the principal Symptoms that may be some Way caused by the *Blood*, and can only be taken from the Mouth of the affected Person. And yet even these, although they may be caused by the Faults in the *Blood*, yet the Diseased only perceives them by the Help of the Nerves ; for the *Blood* being vitiated, and so alter'd, must of Course differently affect the Nerves in its Circulation ; by which the Spirits being disturbed, uneasy Perceptions are produced, which are distinguish'd by these Names : However, the Understanding knows nothing of the Causes by which these Perceptions are excited, and therefore cannot communicate what it doth not know.

By what hath been said it may be concluded, that we can know nothing of the Nature, Properties, secondary or sensible Qualities of the *Blood*, or of any Separations from it, made and lodged in the Body, by any Information from others, or by any View taken by our selves, of what is made or perform'd in our own Bodies.

I shall proceed now to examine what we can in particular know by its Motions and Separations. The Motions, as I have prov'd, are Twofold ; the one of which is purely natural, as being common to all *Fluids* : It is not my Business to enquire into the Causes of this, it being sufficient to my Purpose that it is so ; by the Means of this, if left to its self undisturb'd, it will part and divide into such Parts as seems agreeable among themselves, although unlike to each other ; as is manifest, when extracted out of our Veins, in that it gradually runs into *Serum*, and more consistent Parts. The other is its Circulatory or Animal Motion, in which it seems only passive, being impell'd and drove about the Body by the Motions of the *Heart* and *Vessels* ; and this is probable what preserves it in its genuine *Mixture* and *Crafs*, by reason when it is removed out of the Power of this Motion, it soon breaks, parts and divides, the similar and agreeable Parts herding and associating together by vertue of their own natural Motion ; whereas by this it is hindered from so dividing, and preserved in one continued Mass ; for the *Blood*, being made out of different Substances, and its Parts continually moving, would naturally, if left to it self, run into different Parts : And therefore the Mixture and Union of its Parts, are in proportion to the Quickness or Slowness of its Circulation ; for which Reason it is, that the more vehement it circulates, the less it separates, and the slower it moves the more : And it is from this Reason that fainting and expiring Persons so frequently fall into Colliquative Sweats.

But notwithstanding so very differing Effects arise from these Two Motions of the *Blood*, as that its Mixture is to be preserved by one, and injured by the other ; yet there is a Sort of Consent and Agreement between them for the preserving Life : For if the Natural Motion encreases, by which the

Crafs would be endanger'd, the Animal one is by that very Encrease awakened; and the *Circulation* is intended, whereby the Mischiefs from the first are prevented, and as the Animal one is encreased, the Effects of the other are lessen'd. However, this I think every one may by Experience learn, that there is a Sort of Harmony, Consent or Agreement, between these Two Motions, they mutually depending upon each other; for the *Animal* or *Circulatory* Motion intended by the Natural one, as appears in that the *Pulse* will be affected by any Commotion in the *Blood*, and may be observed to be encreased upon the Admission of the Alimentary Juices into it; and the Natural must be constantly affected by the Animal one, as being disturbed by its continued Progression.

But by reason the *Circulation* of the *Blood* is perform'd by an *Impulse*, it receives from the Organical Parts, viz. The Heart and Arteries, whose Motions are not under the Guidance or Government of the Mind: It may perhaps be suspected by some, that such are incapable of being solicited into unnatural Motions, by reason they can perceive nothing of such an Irritation; besides, they seeming to depend upon the Mechanism or Disposition of the *Parts*, actuated only by constant Influx of Spirits, they must be as that is. I need not produce many Observations to remove this Objection, since it is so obvious in Purging and Vomiting, that several Parts of our Bodies may be irritated into Motion without our Knowledge; and in Truth, all the Organs of our Bodies, whose Motions immediately contribute to Life, are always so moved; but what more particularly answers this, that the *Pulse* always encreases upon the Reception of the

Alimentary Juices into the *Blood*, as every one may experience, by observing it a due Time after Meals.

The *Blood*, notwithstanding its *Crafs*, is preserved by the *Circulation*; yet it is not by that hindered from defending it self by the *Secretory Vessels*, which are so placed and fashion'd as to receive the superfluous and unnecessary Parts, whensoever such are be-fitted to pass through those Ducts; and when they are not, they are sometimes thrown upon other Parts. When the *Blood* thus refines it self by the *Secretory Vessels*, which are by nature prepared for that Purpose, its Performance is Natural; but when by other Ways, preternatural. The first are for the Advantage and Safety of the Body, the last usually the Effect of disorder'd *Blood*; both afford us some Helps to judge of the Condition of the Source from whence they flow.

By what hath been observed, I think it is evident, that the *Blood* is a *Heterogeneous* Body, and that its Parts are in perpetual Fluxion, and that it incessantly moves forwards in its proper Conduits; and that all the Knowledge we are capable of having of its different Conditions, is only by the Means of its *Motions* and *Separations*; and that the Separations in great Measure depend upon the *Circulatory* Motion: Such for the most Part encreasing and lessening in some Proportion, as that Motion lessens or intends, so that the natural and healthful State of *Blood* seems to consist in a Mean between Two Extreams; in one of which its regular Separations are hindered by the Violence of its Progression; in the other, they are enlarged by the Remissness of it.

Of the Blood, with several Experiments made thereupon, by boiling; the Addition of several mix'd Bodies, by the Microscope and Chymical Analysis. From Phil. Verheyen, &c.

Several Authors distinguish the Blood into what is strictly so called, and what is meant at large; by the *Blood* in the extensive Sense, they mean the whole Mass, or that *Fluid* in general, as it flows in the *Blood Vessels*: Hence they divide it into the *Blood* strictly so called, the *Nutritious Bile*, *Pituit* and *Melancholy Aliment*. The *Blood* in a confin'd Sense, is that red Portion of the *Sanguineous* Mass, temperately hot and moist; the *Nutritious Bile*, is a thinner Part of the Mass of *Blood*, temperately hot and dry; the *Pituit*, is a whiter and cruder Part of the *Sanguineous* Mass, temperately cold and moist; the *Nutritious Melancholy* is a blacker Part, more gross, and of an Earthy Substance, temperately cold and moist; they likewise call the *Bile*, *Pituit* and *Melancholy*, *Alimentary*, to distinguish them from an Excrementitious Humour of the same Denomination; to wit, from the *Bile* or *Gall*, collected in the *Liver*, which is called *Excrementitious*, from the *Mucus* or *Snot* in the *Nose*, *Intestines*, and other Parts, from the *Spiritle* and that black Juice secreted in the *Spleen*, and that black Liquor in the *Renes Succenturiati*, which some call *Excrementitious Melancholy*.

As to the *Blood*, the natural Redness that appears in it, seems chiefly to depend on the Advantage of Respiration, from an airy Substance transmitt'd into that Mass through the Arteries, taken its Origine from the left Ventricle of the Heart; from whence, by the *Arteria Pulmonaria* in the Lungs, it derives its rubicund Colour, it being of a darker and black Tincture in the Right Ventricle, but passing through the Lungs it obtains that splendid Redness; as is further proved in treating of the Use of Respiration: Furthermore, that *Blood* being drawn

from the extream Parts, grows black, when expos'd to the fresh Air, it sensibly changes its Colour into a more florid Red, and that more or less, sooner or later, according as the *Blood* is more or less subject to receive it, and the *Air* more impregnated with Matter, apt to strike such a Tincture. And if the *Blood*, when it is drawn from the Body, be stirr'd with a Stick, so that the whole Substance of it be equally expos'd to the *Air*, there will appear no Blackness amongst it, but the whole Mass will be red, as well as that particular Part of it, strictly called *Blood*.

Our Surgeons, when they see the *Blood* that is taken from the Body black, commonly pronounce it to be *Adust*, nor that without some Show of Reason; since we observe not only Wood, but several other solid Bodies grow black with burning, but likewise Liquids, by a constant and strong Boiling; as appears in Malt Liquors, and the Decoctions of most Herbs, and in the artificial boiling of *Blood*: From whence we may suppose the *Blood* in a living Body, through too intense a Heat, as for Example, in a burning Fever contracts its Blackness; in the mean Time, it is not a certain Sign that black *Blood* is adust, from what will hereafter follow, because the *Blood* will receive a Blackness from the Mixture of Spirit of *Vinriol*, and other Things of the like Nature.

It is not therefore the making Power in those Four Humours, as they are said to constitute the *Sanguineous* Mass, but it is better to consider the more subtil and gross, the more volatile and fix'd Parts in the same Mass, as they are more or less concocted, sulphureous, saline, watry and earthy, and

therefore more fluid or solid, alimentary or excrementitious, or more adapted to the Generation of Seed, or other Uses; and that either limpid or tinged with a White, Red, Black or Yellow, Colour. From hence we are apt to call the *Blood*, when of a Yellow Tincture, *Bilious*, whether the Matter tinged with that Yellowness be *nutritious* or *excrementitious*: By the same Reason, the Mass, when it appears crude and not much tintured, such as is met with in *Cachectical Patients*, is usually called *Pituitous*. So Persons, whose Blood is equally mix'd, are said to be temperately *Melancholy*, *Bilious* or *Pituitous*, and those whose Blood is very red, are called *Sanguine*. The Blood when drawn from the Vein and cooled in the Receiver, plainly separates into Two Parts; to wit, into thick, coagulated and fluid Parts; this, except it recedes much from its natural State, is of a high Colour, first Black, then Red, and sometimes covered with a whitish Skin or Crust, that is tough and like Size; the other Part is *fluid* and limpid, frequently of a yellowish Colour, or a little tinged with Red: Hence this is by some called the Serous Parts, and by others, the *Serum* of the Blood, though it differs much from pure *Serum*, as the several *Trials* hereafter will demonstrate.

If the *Blood* fresh drawn from a Vein be shaken in the Vessel, or stirred with a Stick, it does not only gain entirely a Red Colour, as was hinted before, but it preserves it longer *fluid*; neither does it easily separate into Two Parts, like that which is kept still from the first Extraction; from whence it is manifest, that the airy Particles does not only augment the Redness of the *Blood*, but the Coagulation thereof, notwithstanding the constant Fluidity thereof, cannot be reasonably ascribed to the Agitation, since undoubtedly that is greater in the Body, and the Particles more perfectly mix'd by the natural Motion than that artificial Shaking, and yet when the Motion ceases it presently coagulates.

The *Blood*, though it remains *fluid* by a slight Boiling, grows thick by intense Heat, and requires a brown Colour, like that of the *Liver* boil'd, though it be continually agitated while it is heating; from whence we may suspect the same Thing

happens in a living Subject through intense Heat, as in a *Burning Fever*, &c. So that it is not capable of being reduced to its natural State, or be able to support Life.

The more serous Part likewise grows thicker by boiling, which of its own Accord separates or divides it self from the grosser Part in the Receptacle, and acquires a Consistence and Colour almost like the White of an Egg, by a moderate Degree of boiling: From whence we gather, that that Part is not altogether so serous as it appears to the Eye, and is commonly supposed, but that the greatest Part of it is nutritious or alimentary.

The *Blood* is coagulated by the Addition of an *Acid*, even in living Bodies, as hath been proved by Injections, and admits of various Colours, according to those that are cast into it: Hence, by the Addition of Spirit of *Nitre*, it becomes of a darkish White, by that of Spirit of *Vitriol*, it grows Black, according to the Strength of the *Acid*, but less intensely; by the Addition of Spirit of Salt it acquires a mix'd Colour, betwixt that of Spirit of *Vitriol* and Spirit of *Nitre*; to wit, a little inclinable to an Ash-coloured Yellow; by putting in Salt of *Lead*, the *Blood* grows thicker and paler, but not so pale but that the Red prevails; *Vitriol* makes the *Blood* of a dark, dirty Ash-colour; but Salt of Iron or Steel changes the Colour much less: *Sea Salt* and *Nitre* makes a dark colour'd Blood much redder, and in some Measure hinders the Coagulation; so Alkalious Salts perform the same more efficaciously.

I exposed some *Blood* that was made Black by the Addition of Spirit of *Vitriol*, together with some that lay in the Bottom of a Basin, and was grown Black for want of Air; the Surface of this last turn'd Red in about an Hour's Time, but the former held its Colour several Days. And because Alkalious Salts destroy *Acidity*, therefore I had a Mind to try whether they would turn the Black Colour Red again, and accordingly upon the Spirit of *Vitriol* that had blackened the Blood, I poured some Liquor of fix'd *Nitre*, but without any remarkable Effect, though the exceeding Blackness went off a little, but there succeeded a Colour that was rather Greyish than Red.

From

From these and the like Trials, for I made abundance, we learn not presently to infer, that because the *Blood* is Black, therefore it is adust, or because it is White or Pale, therefore it is *crude*, since the Humours preternaturally various are produced from various Causes; neither does it appear that they are not like, which emulate the Nature or Spirit of *Nitre* or *Vitriol*.

We may learn from these Experiments, that though *Acids* agree in this, that they coagulate the Blood, yet they produce other different Effects that are very opposite to each other; for the *Blood*, as said before, that is tinged Black with Spirit of *Vitriol*, is made White by Spirit of *Nitre*; neither is it to be doubted but those Things which give a great Alteration to the Colour, also give another Turn to, or much alter the *Crafs* of the Blood; therefore I think, that those Things which powerfully change the Colour and Consistency ought cautiously to be made use of, although they may be reckon'd amongst the Salubrious Medicines; for tho' they may be administred, they ought not to be given with that Liberty: Therefore from hence we may observe, that where the *Blood* is too Black, to abtain from Spirit of *Vitriol*; and if any *Acid* is proper to be administred, that we rather make use of Spirit of Salt, or *Nitre*.

Neither is the *Blood* only liable to these Changes; but likewise that more *fluid*, *limpid* and *glutinous* Part, called the *Serum* of the *Blood*, which admits of different Colours and Consistency from the Addition of different Bodies; for if to that Part we mix Spirit of *Nitre* or *Alum*, either burnt or *crude*, it turns to a White Curd, but easier by the bare Addition of *Alum*, which makes the Curd harder and tougher; but if it be much ting'd, it will not be so white: The same Thing happens by the Addition of *Salt of Lead*, but much more imperfect, because the Whiteness is muddier, neither is the Mass so thick, and the Precipitation is quicker. Spirit of Salt does not coagulate or curdle this *Fluid*, but makes it more limpid, at least when the Mass, as it commonly happens, is ting'd with Red; for it destroys their Colour, and scarce procures any other observable Change. Spirit of *Vitriol* makes the tinging Particles much blacker.

I made these Trials with Ox's *Blood*, which I had ready at Hand; but afterwards I made Experiments upon the *Blood* of Men who were in a reasonable State of Health, in which I observ'd no great Alterations, only that the Red Part did not grow so Black upon the Addition of the Spirit of *Vitriol*, and became less white with that of Spirit of *Nitre*; and so of the rest. I got that Part of Humane *Blood* called the *Serum*, that was pure, and not the least Redness in it, but a little yellow Tincture; this by gentle boiling acquired a white Colour, and the Consistency of the White of an Egg almost hard boild; this would curdle by pouring upon it Alum, and grow Milky by the Addition of Spirit of *Nitre*, but would not become so thick, as the like Part of the Blood of an Ox. I imputed this lesser Change of the Humane Blood to proceed from the greater Serosity thereof, and the less abounding of Nutriment, for the Ox's Blood was taken from lean Feasts; for while they feed they eat much, but are not used to drink so much Liquor. Hence I made a Trial on my own *Blood*, and observed the Alterations to be the same as that in the Blood of others.

These Things premised, we shall proceed in the Description of the Changes I observ'd in the Blood of several Men and Beasts. Vinegar darken'd several colouring Particles but weaker than Spirit of *Vitriol*; of the others it made no Change; *Sea Salt* and *Nitre* change not only the tinging Particles, that are darker, become more shining, but that is so small, 'tis but visible in few; the fixed Alkalious Salts scarcely make any Alteration; *Blue Vitriol* slightly curdles this Mass, and gives it a whitish Green Colour; *Green Vitriol* only just disturbs the *Fluid*, but does curdle it, and the less Change arises from the Addition of the artificial Part, which is the *Sal Chalybis*; then the *natural Vitriol*, Spirit of *Vitriol*, with *Sea Salt* or *Nitre* added to that serous Part, makes a white Curd, but much more perfect with *Sea Salt*.

Spirit of Salt or *Vitriol*, added with *Alum* to the same Body, hinders the Effect of the *Alum*; so that the Mass, which was forced only by the *Alum* into Curd, is only lightly disturbed or agitated; nay, the Coagulation made.

made by the *Alum* is removed by those Spirits; Spirit of *Nitre* and *Alum* perform almost the same Effect, whether added together or alone; fixed *Alkali Salts* hinder the Effect of Spirit of *Nitre*; nay, a Coagulation made by that Spirit is dissolved by the same Salt, and the Mass render'd limpid again; I have not made a Trial with the Volatiles: The Reason of the Coagulation seems to be thus: That the Points of the Particles of *Alum*, &c. enter into the Pores of the Particles of the Liquor, and do as it were bind them, and so stop their Motion; but the Reason of the Change of Colours is not so easily given, except it be a General one; namely, That by a Mixture of various Things, their *Superficies* are variously chang'd or alter'd, so that the visual Rays are sometimes reflected one Way, and sometimes another.

We shall next proceed to an Examination of the Particles of the *Blood*, by the Assistance of the *Microscope*, whereby I have seen in a small Drop of it several Kinds of Particles; for some will appear very long, and in some Measur'd pointed, like Windle Straws; others of a small Extension, and amongst these many globular or round ones; some of Three, Four, or more Points, or of an irregular Figure; amongst the globular ones few are to be met withal that are perfectly Spherical, but more of them are of an Oval Figure; and others there are that give an Unevenness to the Superficies: But the said Particles may be better view'd if the Blood be examined while it flows from the Wound, and is received into warm Water, and presently after shaken; so will the Mixture become less obscure, and the Particles of the Blood less intricate amongst themselves, so that they may be more exactly seen.

In the Part of the washing of the *Blood*, or in the Water which extracted the Tincture from the coagulated *Blood*, the Particles will appear very various, but in Proportion a great deal more round; but the grosser or more fibrous Parts which are seen in the Blood promiscuously mix'd, do not appear herein, since in such a Lotion you have nothing but the more subtle Parts of the *Blood*.

In the gelatinous Part of the *Blood*, separ-

ated from the rest spontaneously in the Basin, and from thence purified by frequent Decantations and Subsidings, and freed from the gross and redder Part, may be perceived Particles of various Kinds, but not so common as the round ones in the washing of the Blood, neither are they seen so plain, that their Tracings may be exactly observ'd, which sometimes happen in other limpid and thin Liquors.

Although from the said Experiments it may seem to follow, that the globular Particles of the Blood contribute much to the Redness of its Colour. I cannot by any Means persuade my self that it depends on that only, since they are not less frequently found in *White Milk* than in *Red Blood*; and what takes away the Redness of the Blood, does not always take away those round Particles.

In examining the *Blood* by Chymical Analysis, because I could not easily come at Humane Blood, and then only such as was Diseased, I took the Blood of an Ox watn from the Vein and put it into a *Cucurbit*, which I set into *Balno Marie*. First of all the Liquor came out not in great Drops like common Water, but with some Appearance of Stria or Ridges; what came over was very thin and limpid, almost of no Taste, and something of an ungrateful Smell, but yet not properly Fætid: The Quantity of a Spoonful of it, by adding a few Grains of Salt of Lead, would turn of a Milky Colour and Consistence. From what I could gather from the said Qualities was, that this was a Liquor compounded or made up of abundance of *Flegm*, *Sulphur* in a small Quantity, and a little Salt. The next Liquor that succeeded in Distillation was more watry, yet produced nothing which did not turn muddy with something of Whiteness, by putting to it Salt of Lead; a plain Sign it was not *Flegm*, since that is by no Means disturbed or muddied by the Addition of that Salt. When I could produce nothing further by the Heat of the Bath, I removed the *Cucurbit* with the Blood into a Sand Furnace; where, giving a stronger Heat, I obtained further a Liquor more impregnated with a Volatile Salt and Sulphur, but tinged with an *Empyreuma* or Burning, expelling the more watry Humidity.

I distilled the rest by a *Retort* with a reverberating Fire, and from thence I drew off again another more watry Part, by a Heat not over violent; that was followed by a subtle Liquor that was very penetrating, and struck sensibly upon the Organs of Tasting and Smelling, and which was not a little efficacious in promoting Sweat; which kind of Liquor is sometimes called Spirit of Blood, from whence a volatile Salt and thick Fœtid Oil is gain'd, there remain'd in the *Retort* a *Caput Mortuum*, which was chiefly Earthy, and could not by any Force of the Fire be driven into the Receiver: The Salt thus raised was much more active and volatile than the Spirit, whence its Rectification is ascended first, though in the first Distillation, by reason of its intimate Union with the other Particles, it was difficultly driven over, and would not appear till after the Flegm and the greatest Part of the Spirituous Liquor was risen. I put again the Ox's Blood in *Balneo Marie*, but the Liquor that came first over was not so *Sulphureous* as in the former Process; and this must be so undoubtedly, because there was a greater Evaporation before Distillation. The Humane Blood likewise afforded me the same sort of Liquor; which I had from a Surgeon, who told me he took it from a sound Body.

But that I may examine into the Quantity and Proportion of the Chymical Elements existing in Blood, I took such Blood as I could get of a Male, that was of a grown Age, then labouring under a Defluxion of Humours upon the Shoulder and Pectoral Muscles, occasion'd by a Rheumatism, of which I had Six Ounces and as many Drams: When this had stood some Hours in an open Vessel, I judged it was divested of its Spirituous Part, which in Distillation of the Ox's Blood I would not put into the *Balneo Marie*, but kept it digesting for some Days in Horie-Dung. That Blood being in some Measure putrified, I put into a Glass *Cucurbit*, and distilled it in Sand with a moderate Fire, till nothing would further ascend; rectifying the said Liquor, I took about Two Drams of the Spirituous Matter, which first appeared in the Distillation of the Ox's Blood, but by reason of the former Putrification of this Blood, it stunk egregiously, and therefore, as being nauseous, I cast it away.

When I came to wash the Receiver with Water, it presently contracted a milky Colour, which was a Sign it was very Oily; there remain'd in the *Retort* a Black Mass that was tough and compact as Pitch, which I altered with great Difficulty, and it weighed Two Ounces; this I put into a Glass *Retort* cooled, and distilled with a reverberatory Fire as long as I could see any Thing appear; in the *Retort* there remain'd a blackish Mass, something light, dry and Spongy, which taken from the *Retort*, weigh'd about Two Drams; of which, making a Lixivium with Rain-water, I was willing to try whether, after the Digestion of the Blood and violent Action of the *Retort*, any Thing of a fixed Salt remain'd, but the Vessel was broke that contained the Lixivium, by the Imprudence of a Servant, and I was disappointed of the End of my Labour: The Receiver containing a Matter after Distillation, I transferred that into Sand, serving me instead of a *Cucurbit*, and fitted a blind Alembick to it, and took about half a Dram of the purest white volatile Salt, then placing a Beck'd Limbeck to it, and encreasing the Fire, there was produced a Spirituous Liquor, the *Empyreuma* smelling sweet, and was in Quantity about Two Drams and a half; the Liquor remaining after this last Distillation I put into a Filtring Paper, first wetted with Rain-water, and repeating often the Filtration I obtain'd almost Two Drams and half of Oil separated from the Flegm; and that which stuck to hard that I could not get from the Glass, I reckon weigh'd a Scruple; so that the Weight of the whole Oil might be about Eight Scruples and a half; but that Oil had an abominable Stench both to the Nose and Palate, the greatest Part being thick and black, the lesser Part something fluid and yellowish: The Weight of the Flegm, both from this and the first Distillation, was about Five Ounces and a Dram, and there was not lost above Two Drams in the whole Distillation.

If from hence therefore I may be allow'd to make a Computation of the Quantity and Proportion of the Principles contain'd in Humane Blood, I am of Opinion I shall not vary from the Truth, if I affirm that in Seven Ounces of Humane Blood there are contained Five Ounces and Six Drams of
Water

Water or Flegm, three Drams of a subtle Oil or oily Spirit, or little more, and about eight Scruples of a thick Oil, scarce two Drams of Salt that is all volatile, and little more than two Drams of Earth. And tho' the said Proportion and Quantity of Principles may be exactly observed, yet we cannot from hence rigorously make Conclusions of the Blood of other Men; nay, nor so much as of the Blood of the same Person at another Time; because not only of the different Things received, and the different Quantity of them, which produce different Proportions of Principles, but likewise the Diversity of the Temperament of Men, Air, Exercise of Body, and several other Things, that contribute more or less to the raising or dispersing of those Principles, whence also their Proportions may easily vary.

At another Time I received twelve Drams of Powder from a certain *Apothecary*, which remained from a Portion of Blood taken from his own Body, and dried by a gentle Fire; from which Powder, being distilled with a *Reverberatory* Fire, I gain'd something more than a Dram, and therefore much less than from the Blood examin'd before; which was, either because the *Blood* of this Person did not so much abound with volatile Salt, or because the other *Blood* was dissipated before Distillation, or that this lost a great deal of its Salt in drying. The rest of the Principles I did not examine, by reason that I could make no Observations of the Flegm and Spirits from the large Evaporation that had been first made of them.

Hitherto I could discover no acid Salt either in Humane *Blood* or that of Brutes; but the contrary proves, that it is not the Matter from which the Blood is made, but that the Acids are secreted from the Blood; which further appears, because there are few who

do not eat some Sort of Acids or other with their Food, as Vinegar, Lemon, and the like. So Salt is continually mix'd with our Victuals, and it does not by any Tryals appear that that Acidity is destroy'd in Chylification, or separated from the Chyle in its Passage to the Mass of Blood; therefore it remains to be secreted or secreted afterwards, either by Urine, Transpiration, or the like, since we cannot find it actually present in the Blood. In the mean time, we ought to try if by Art we can gain an acid Salt from the Blood; for which Purpose, I took a sufficient Quantity of Bullock's Blood, and boil'd it with Rain Water, then clarified the strain'd Liquor with the White of an Egg, and evaporating it to the Consistence of a Syrup, I reduced it to a small Quantity, so made an Extract of the *Blood*. In the Evaporation, I perceived there was always a lixivate Smell, which undoubtedly proceeded from the going off of the *volatile Alkali Salt*: The Extract being posited in a cold Place, let no Salts fall to the Bottom, so that it was evident there remained few or none of a fix'd Nature. This *Extract* I mix'd separately with various *Alkali's*, as well as *Acids*, but observed no Fermentation. At last of all I mix'd it with Syrup of *Violets*, which it turn'd green, and which was a Sign the *Alkali Salt* was predominant, as the Change of the Syrup into a Red or Purple is a Token that the Acid prevails. But because this Extract did not raise a *Fermentation* with *Acids*, we might judge the Predominancy was small; yet it is not to be doubted but that it is much greater in the Mass of *Blood*, because, as I have said, in the Evaporation I perceiv'd a Smell like that of a lixivate Salt: Besides, the *alkalious Salts* are much more volatile in Animals than the acid ones.

Of the Motion of the Heart, and Circulation of the Blood. From Harvey, Lower, Wallæus, De Buck, Ent, Bartholin, Baglivy, Verheyen, St. Hilaire, &c. And first of Harvey's Circulation, &c.

THE Heart of all Creatures being dissected whilst they are yet alive, by opening the Breast, and cutting open the *Capsula* or *Pericardium* that incloses the Heart, you may observe that it sometimes moves, and sometimes rests. This is evident in the Hearts of colder Creatures, as *Toads*, *Serpents*, *Frogs*, *Crevises*, &c. but it shows it self more manifestly in the Hearts of hotter Animals, as *Dogs*, *Swine*. If you observe diligently while the Heart is dying, and moves faintly, then you may plainly see that the Motions are slower and seldomer, and the Restings of longer Continuance; and you may distinguish easily what Manner of Motion it is, and which Way it is made.

In the Motion, Three Things are to be observed: First, That the Heart is erect, and that it raises it self to a Point, and beats against the Breast, so that the Pulsation is felt outwardly. Secondly, That there is a Contraction of it every Way, especially of its Sides, so that it appears lesser, longer, and more contracted. The Heart of an *Eel* taken out, and exposed, demonstrates it. Thirdly, The Heart being grasped in one's Hand whilst it is in Motion, feels harder, which arises from Tension. 'Tis further observ'd in Fish, and colder Animals having Blood, that when the Heart moves, it looks whitish; when it ceaseth Motion, or remits, it appears of a Blood Colour. From hence I gather'd, that the Motion of the Heart was a Kind of Tension in every Part of it, according to the Drawing and Constriction of the Fibres every Way; because it appear'd, that in all Motions it was erected, received Vigour, grew less and harder; that the Motion of it was like that of the *Muscles*, where the Con-

traction is made according to the Drawing of the Fibres; for the *Muscles*, whilst they are in Motion, are invigorated and stretch'd, from soft become hard, erect and thicker: So likewise does the Heart.

From these Observations we may conclude, that the Heart, whilst it is in motion, suffers Constriction, and is thicken'd in its Outside, and so is contracted in its Ventricle, that it thrusts forth the Blood contain'd within it; therefore these Things happen at the same Time, to wit, the Tension of the Heart, the Erection of the Point, the Pulsation against the Breast, the Incrassation or Thickening of the Sides, and the forcible Protrusion of the Blood by Constriction of the Ventricle. Hence the contrary of the common receiv'd Opinion appears, which is, That when the Heart beats against the Breast, the Ventricle is dilated and fill'd with Blood, and that when the Heart is contracted, it is emptied: For that Motion which is commonly thought the Diastole of the Heart, is really the Systole, and so the proper Motion of the Heart is not a Diastole, but a Systole.

In the Motion of the Heart, these Things are further to be observ'd in relation to the Pulsation and Motion of the Arteries: First, That whilst there is a Tension and Contraction of the Heart, a Percussion of the Breast, and an apparent Systole, the Arteries are dilated, pulse, and are in their Diastole. Likewise when the right Ventricle propels the Blood contain'd in it, the Arterious Vein beats, and is dilated, together with the rest of the Arteries of the Body. Secondly, When the left Ventricle ceaseth to move, beat, and be contracted, the Beating of the Arteries ceases; nay, when the Tension is but faint, the Pul-

sation of the *Arteries* is hardly perceptible; and so likewise in the *Arterial Vein* when the Right ceases. *Thirdly*, In cutting or piercing any *Artery*, in the very *Tension* of the left *Ventricle*, the *Blood* is forcibly thrust out of the Wound; so cutting the *Arterial Vein* at the same Time, and in the *Tension* and *Contraction* of the right *Ventricle*, you shall see the *Blood* burst out forcibly from thence.

So likewise in *Fishes*, cutting the great Trunk which leads from the *Heart* to the Gills, at which Time you shall see the Heart stiff and contracted, and thence observe the *Blood* forcibly driven out. *Lastly*, As in the cutting of any *Artery*, the *Blood* leaps out sometimes farther, sometimes nearer, you shall find the Leaping out to agree just with the *Diafole* of the *Artery*: From whence it appears clear, that the *Diafole* of the *Artery* is at the same Time with the *Systole* of the *Heart*, and that the *Arteries* are filled and distended by reason of the Immission and Intrusion of *Blood* made by the Constriction of the *Ventricles* of the *Heart*; as likewise that the *Arteries* are stretch'd. Again, we may see that the Pulsation of the *Arteries* arises from the Impulsion of *Blood* from the left *Ventricle*; just so as when one blows into a Glove, all the Fingers swell up together, and resemble the Pulsation: As also, according to the *Tension* of the *Heart*, the Pulsations are greater, more vehement, frequent and swifter, keeping the Number, Quantity, and Order of the beating of the *Heart*.

Besides, there are many Things observable which relate to the Ears, and which *Gaspar Bauhinus* and *Riolan*, both Accurate Anatomists, have taken Notice of, and inform us, that if in *live Dissections* we have Regard to the Motion of the Heart, we shall see four Motions distinct both in Time and Place. Now there are four Motions distinct in Place, but not in Time; for both the Auricles or Ears move together.

There are as it were at one Time two Motions, one of the Ears, and another of the *Ventricles* themselves; for they are not just at one Instant, but the Motion of the Ears goes before, and the Motion of the Heart follows: The Motion seems to begin at the Ears, and to pass on to the *Ventricles*.

When all Things are already in a languishing Condition, the Heart dying away, as it is both in *Fishes*, and other colder Animals which have *Blood*, there intercedes some resting Time betwixt these two Motions, and the Heart being as it were weaken'd, seems to answer the Motion sometimes swifter, and sometimes slower. Last of all, drawing towards Death, it ceases to answer by its Motion, and only seems to move insensibly, that it gives as it were only a Sign of Motion to the Ears; so the Heart first leaves beating before the Ears, so that the Ears are said to outlive it. The left *Ventricle* leaves beating first of all, then its Ear, then the right *Ventricle* last of all, which *Galen* observes; all the rest giving off and dying, the right Ear beats still, so that Life seems to remain last of all in the Right. But this is chiefly to be observ'd, that after the Heart has left beating, and the Ears are beating still, if you put your Finger upon the *Ventricles* of the Heart, every Pulsation is perceiv'd in the *Ventricles* just after the same Manner as we said the Pulsations of the *Ventricles* were felt in the *Arteries*, a Distention being made by Impulsion of *Blood*, and at this Time the Ears only beating, if you cut away the Point or Tip of the Heart, you shall see the *Blood* flow from thence at every Pulsation of the Ear, so that from thence it appears which Way the *Blood* comes into the *Ventricles*, which is not by Attraction or Distention of the Heart, but by the Impulsion of the Ears.

It is to be observ'd, that all those which I call Pulsations, both in the Ears and in the Heart, are Contractions, and that the Ears are evidently first contracted, and afterwards the Heart itself: For the Ears, whilst they move and beat, become whitish, especially when there is little *Blood* in them; for they are fill'd, as the Cellars and Treasuries of *Blood*, by the compressive Motion of the Veins, and the tending of its proper Centre; nay further, it is most evident in the Ends and Extremities of them, that the Whiteness arises meerly from the Contraction of them. In *Fishes* and *Frogs*, and the like, having but one *Ventricle* of the Heart, for instead of one Ear, they have a little Bladder placed at the Bottom of their Heart full of *Blood*, you shall most evidently see the

Blad-

Bladder first contracted, and the Contraction of the *Heart* follow.

After these and the like Observations, it will be found that the Motion of the *Heart* is after this Manner: First of all, the *Ear* contracts it self, and in that Contraction throws the *Blood* with which it abounds, as the Head Spring of the Veins, and the Cellular and Cistern of *Blood*, into the *Ventricle* of the *Heart*, which being full, raises or erects it self, stretches all the *Nerves*, contracts the *Ventricles*, and makes a Pulsation; by which Pulsation it continually thrusts that *Blood*, which by the *Ears* is sent in into the *Arteries*; the *Right Ventricle* into the *Lungs*, through that Vessel which is called the *Vena Arteriosa*, but is to all Intents and Purposes an *Artery*; the *Left Ventricle* into the *Aorta*, and so by the *Arteries* into the whole Body.

These Two Motions, the one of the *Ears*, the other of the *Ventricles*, are so done in a continued Motion, as it were keeping a certain Harmony and Number, that they are both perform'd at the same Time, and one Motion only appears, especially in hotter Creatures, whilst they move suddenly; nor is this done otherwise, than when in *Engines* one Wheel moving another, they seem all to move together; and in the Lock of a Gun, by drawing of the Spring, the Flint falls, strikes the Steel, fires the Powder, enters the *Touch-hole*, discharges the Ball, hits the Mark, and all these Motions, by reason of the Swiftnes of them, appear in the twinkling of an Eye. So likewise in Deglutition, the Meat or Drink is thrown into the *Jaws*, the *Larynx* is shut close by its own *Muscles*, and the *Epiglottis* is lifted up and opened by its *Muscles*, just as a Sack is raised to be fill'd, and opened that it may receive; it thrusts down the Meat or Drink, being received by the *thwarting Muscles*, and with the *long Muscles* sucks it down; yet notwithstanding that all these Motions are made by several and contradistinct Organs, whilst they are done in *Harmony* and Order, seem but to make one Motion and Action, which they call Swallowing.

The Motion of the *Heart* then is after this Manner, and the Transfusion and Propulsion, by Mediation of the *Arteries*, is one of the Actions of the *Heart*; so that

the Pulsation which we feel, is nothing else but only the Impulsion of the Blood by the *Heart*: But whether or no the *Heart* contribute any Thing else to the Blood, besides the Transposition, local Motion, and Distribution of it, we must enquire afterwards, and collect out of other Observations. Let this suffice for the present, that it is sufficiently evidenced, that in the beating of the *Heart* the *Blood* is transfused into the *Arteries* through the *Ventricles* of the *Heart*, and so distributed into the whole Body.

Since it is probable that the Contexture of the *Heart* and its Union with the *Lungs* gave an Occasion to the Ancients to mistake the Ways by which the Blood could be carried out of the *Veins* into the *Arteries*, it will be necessary to clear up that Difficulty; and first of all, the Thing is clear enough in Fishes, who have but one Ventricle of the *Heart*, as having no *Lungs*; for it is certain it may be confirm'd before our Eyes, that the Bladder of Blood which they have at the Bottom of the *Heart*, answerable to the *Ear* of the *Heart*, sends the *Blood* into the *Heart*, and that the *Heart* does afterwards, through a *Pipe* or *Artery*, or something corresponding to an *Artery*, openly transfuse it, both by our own View, and also by cutting the *Artery*, the *Blood* leaping out upon every Pulsation of the *Heart*.

You may likewise see the same in all other Creatures, in which there is but one Ventricle only, or something answerable to it; as in the *Toad*, *Frog*, *Serpent* and *House-Snails*; which though they are said in some manner to have *Lungs*, because they have a kind of Voice, yet from ocular Demonstration it is plain, that the *Blood* in them, by the Pulsation of the *Heart*, is brought out of the *Veins* into the *Arteries*, the Way being open and manifest, there is no Occasion of Doubt or Difficulty at all, for the Case is the same with them as it might be with a Man, if the Partition of the *Heart* were pierced through or taken away, and so both the *Ventricles* become one; I believe no Body then would doubt which Way the *Blood* should go out of the *Veins* into the *Arteries*. And seeing there are more Creatures which have no *Lungs* than there are which have, and more which have but one

Ventricle than there are which have Two, we may very well affirm, that for the most Part the *Blood* is transfused out of the *Veins* into the *Arteries*, through the Bottom or Cavity of the *Heart* by an open Passage.

In an *Embrio* there are Four Vessels of the *Heart*; the *Vena Cava*, the *Vena Arteriosa*, *Arteria Venalis*, and the *Aorta* or great *Artery*. The first Union of the *Vena Cava*, with the *Arteria Venosa*, which meets before the *Vena Cava* opens it self into the *Right Ventricle* of the *Heart*, or sends out the *Coronal Vein* a little above its Exit from the *Liver*, displays to us its Orifice Sideways, that is to say, a Hole wide and large, of an oval Figure, made passable quite through from the *Vena Cava* into that *Artery*; so that through that Hole, called the *Foramen Ovale*, the *Blood* may freely pass out of the *Vena Cava* into the *Arteria Venosa*, and the *Left Ear* of the *Heart*, and so to the *Left Ventricle*: There is besides, opposite to that Place which looks towards the *Arteria Venosa*, a thin hard Membrane like a Cover, which afterwards in those of riper Years, covering this Hole, and growing together, quite stops it up, and takes away almost all Signs of it.

The other Union is that of the *Vena Arteriosa*, and is as it were a Third Trunk, or *Arterial Duct*, perforate into the *Great Artery*; so that in the Dissection of *Embrio's*, there appears as it were Two *Aorta's*, or Two Roots of the great *Artery*: This *Conduit* likewise in those that come to mature Age, dwindles or fades away, and at last is quite dried up and lost like the *Umbilical Vein*. This *Arterial Branch* hath no Membrane to hinder the Motion of *Blood* backward or forward, for there are in the Orifice the *Vena Arteriosa*, of which this is a Branch; Three Doors or *Valves*, of the Shape of a Σ , which appear outwardly and inwardly, and easily give passage to the *Blood*, flowing into the *Right Ventricle* this Way, but on the contrary hinder any Thing that may flow from the *Artery* or the *Lungs* into the *Right Ventricle*, which they shut very close; so that here we have Reason to believe, that in an *Embrio*, when the *Heart* contracts it self, the *Blood* must always be carried out of the *Right Ventricle*

into the great *Artery*. In answer to the Objection that has been made, that these Two Conjunctions to large and spacious were made for the Nutrition of the *Lungs*, and that in those of riper Years, when the *Lungs* by reason of their Heat and Motion require greater Supply of Nourishment, they should have taken away and made up, is an Invention improbable and inconsistent; I say, it is visible to our Eyes, that both in an *Egg*, whereon a *Hen* hath sat, and in *Embrio's* newly taken out of the *Womb*, the *Heart* moves as in those of *Adults*; and likewise Nature is puffed with no such Necessity as to make those large Passages mentioned for the Nutrition of the *Lungs*; for the *Heart*, by its Motion, brings forth the *Blood* from the *Vena Cava*, the *Right Ventricle* receiving the *Blood* from the *Auricle*, propels it through the *Vena Arteriosa*, and its Branch into the great *Artery*; likewise the *Left* at the same Time, by the Motion of its *Auricle*, receives that *Blood* which is brought through the *Foramen Ovale* from the *Vena Cava*, and by its Tension and Constriction, drives it through the Root of the *Aorta* into the great Trunk: So in *Embrio's*, whilst the *Lungs* are idle and have no Action nor Motion, Nature makes use of both *Ventricles* of the *Heart* as of one, for trans-mission of *Blood*; and to the Condition of *Embrio's* that have *Lungs* and make no Use of them, is like that of those Creatures which have none at all.

We shall proceed in the next Place to prove, that in the more perfect Animals, and those come to Maturity, as Man, the *Blood* may pass from the *Right Ventricle* of the *Heart* by the *Vena Arteriosa* into the *Lungs*, and from thence through the *Arteria Venosa* into the *Left Auricle*, and from thence into the *Left Ventricle* of the *Heart*. It is sufficiently evident that nothing can hinder this Passage, if we consider how Sweat passes through the Pores of the Skin, or how *Urine* is separated in the Strainer of the *Kidneys*; as may be more particularly observed in those who drink Mineral Waters; those therefore who deny that the Mass of *Blood* can pass through the Substance of the *Lungs*, and yet allow the Nutritive Juice a Passage through the *Liver*, ought to consider that the Strainers of the *Liver* and the *Kidneys* are

are much thicker than that of the *Lungs*, because the latter are much thinner woven, and of a more Spongy Substance, if compared to the former. In the *Liver* there is no impulsive Force, in the *Lungs* the Blood is driven forward by the Impulsion of the *Right Ventricle*, and the Compression of the *Pectoral Muscles*; by which Means, in the first Place, there must necessarily follow a Distension of the Vessels, and in the next Place a Progressive Motion, by the rising and falling of the *Lungs* in Respiration.

Thus much of the Transfusion of the Blood out of the *Veins* into the *Arteries*, and how it is disposed of, and transmitted by the Pulse of the Heart: Now I shall say something of the Quantity and Encrease of *Blood* which passeth through the Body. When I had often and seriously considered with my self what Plenty there was of *Blood*, both by the Dissection of living Creatures for Experiments sake, the opening of *Arteries*, and many Ways of searching, and from the Symetry and Size of the Ventricles of the *Heart*, and of the Vessels which go into it, and out of it; since Nature making nothing in vain, did not allot that Greatness to those Vessels to no Purpose, as likewise from the continued and careful Artifice of the *Valves* and *Fibres*, and the rest of the Fabrick, and from many other Things; and when I had a long Time considered with my self what Quantity of *Blood* was passed through, and in how short Time that Transmission was done, whether or no the Nutrition we receive could furnish this or no; at last I perceiv'd that the *Veins* would be quite emptied, and the *Arteries* on the other Side be burst with too much Intrusion of *Blood*, unless it passed back again some Way or other out of the *Veins* into the *Arteries*, and returned into the *Right Ventricle* of the *Heart*. I began then to think with my self, that the *Blood* might have a *Circular Motion*, which afterwards I found true, and that it was driven out of the *Heart* by the *Arteries* into the whole Body, by the Contraction and Pulsation of the *Left Ventricle* of the *Heart*, as it is driven into the *Lungs* through the *Vena Arteriosa*, by the beating of the *Right*, and that it returns through the little *Veins* into the *Vena Cava*, and to the *Right Auricle*

of the *Heart*; as likewise out of the *Lungs* through the afore said *Arteria Venosa* to the *Left Ventricle*; which Motion we may be allowed to call *Circular*.

There remains Three Things further to be confirm'd, in order to demonstrate this Circulation beyond Contradiction: First, That the *Blood* is continually, and without Intermision, carried out of the *Vena Cava* into the *Arteries*, in such Quantities that it cannot be recruited by any Sustenance or Aliment we take in; so that the whole Mass of *Blood* would quickly pass through. In the Second Place, That continually, and without Intermision, the *Blood* is driven into every Member and Part, by Means of the Pulsation of the *Arteries*; and that in far greater Abundance than is required for the Nourishment of the Parts, or than the whole Mass is able to furnish. And likewise, Thirdly, That the *Veins* themselves do perpetually bring back the *Blood* into the great Cistern or Receptacle of the *Heart*.

These Things being prov'd, I think it will appear that the *Blood* goes round, is return'd, and then driven forward from the *Heart* to the Extremities, and from thence into the *Heart* again, so makes as it were a *Circular Motion*. Let us suppose how much *Blood* the *Left Ventricle* contains in its *Dilatation* when it is full, either by Calculation or Experiment; as for Example, whether Three, Two, or One Ounce and a half of *Blood*: I have found in that of a Dead Man above Two Ounces. Let us suppose likewise, how much lets in the Contraction the *Heart* may contain, and how much lets capacious the *Ventricle* is, and from thence how much *Blood* is thrust out of the *Great Artery*, for in the *Systole* there is always some propelled, which we may suppose from the Texture of the Part. Therefore from a probable Conjecture we may affirm, there is sent in of this *Blood* into the *Artery*, a Fourth, Fifth, Six, at least an Eighth Part; so that if we grant that in a Man there is sent forth at every *Pulse* of the *Heart* an Ounce and a half, or Three Drams, or but a Dram of *Blood*, which by the Hindrance of the *Valves* cannot return to the *Heart*; and that the *Heart* in one Half Hour makes above a Thousand Pulses, and sometimes Two, Three

or Four thousand: Now if we multiply the Drams, either a Thousand times Two Drams, or Three Drams, or Five hundred Ounces, or such a proportionate Quantity of *Blood* is transfused through the *Heart* into the *Arteries*, which is more than is to be found in the whole Body.

But if we grant that this is not done in half an Hour, according to the former Supposition, but allow a whole Hour or a Day for it, it is plain that more *Blood* is continually sent through the *Heart* than either the Food which we receive can furnish, or is possible to be contained in the *Veins*; nor is it to be said, That the *Heart* in its Contraction sometimes pushes out *Blood*, and sometimes none at all, or as much as nothing, or something imaginary; for if in the Dilatation of the *Heart* the *Ventricles* are filled with *Blood*, it is necessary that in Contraction it should be propelled, and that not in a very small Quantity, since the Vessels are large, and the Protusion frequent; it is very necessary likewise in every Propulsion, that the Proportion of the *Blood* pulsed out should be a Third, Sixth or Eighth Part, in Proportion to that which is before contained in the *Ventricle*, and which filled it in the *Dilatation*, according as the Proportion of the *Ventricle* in Contraction is to the Proportion of it in the Dilatation. Wherefore it is to be concluded, That if in a Man or other Animal the *Heart* pulses out a Dram, and there be a Thousand Pulses in half an Hour, that there are Ten Pounds Five Ounces of *Blood* transmitted in that Time; and if at one Pulse it sends forth Two Drams, Twenty Pounds, Ten Ounces; if half an Ounce, Forty one Pounds, Eight Ounces; if an Ounce at every Pulse, then Eighty three Pounds Four Ounces will be transfused in half an Hour out of the *Veins* into the *Arteries*.

But suppose the *Blood* pass through the *Heart* and *Lungs* in the smallest Quantity we can well imagine, it is conveyed in greater Plenty into the *Arteries* than it is possible to be supplied by any Nourishment which we receive, unless we admit of a Regress by Way of *Circulation*: This likewise appears by our Senses when the least *Artery* is cut, for then the whole Mass of *Blood* will be drained out of the Body, as well from the

Veins as the *Arteries*, in half an Hour's Time. And *Butchers* can attest this, when in killing of an *Ox*, &c. they cut the *Jugular Arteries*, they drain the whole Mass of *Blood* in less than a quarter of an Hour, and empty all the other Vessels of the Body.

Hence it is manifest, and from what has been otherwise laid down, that the *Arteries* receive *Blood* no where else but from the *Veins*, by transmission through the *Heart*; wherefore, if you tie the *Aorta* at the Root of the *Heart*, and open the *Jugular* or any other *Artery*, you will see the *Arteries* empty, and the *Veins* full. And from hence likewise we may observe in Anatomical Dissections, the Cause why so much *Blood* is found in the *Veins*, and so little in the *Arteries*; why there is a great deal found in the *Right Ventricle*, and but a little in the *Left*; because there is no Passage afforded from the *Veins* into the *Arteries*, but through the *Lungs* and the *Heart*; but when the *Lungs* have expired, and leave off to move, the *Blood's* Passage is stop'd from the little Branches of the *Vena Arteriosa* into the *Arteria Venosa*, and so into the *Left Ventricle* of the *Heart*, as in an *Embryo* it was before observ'd; that it was stop'd by reason of the want of Motion of the *Lungs*, which open and shut up those narrow Passages; but seeing the *Heart* does not leave off Motion at the same Time with the *Lungs*, but beats afterwards and out-lives them, it comes to pass that the *Left Ventricle* and the *Arteries* send forth *Blood* into the Body, and not receiving it through the *Lungs* again, therefore appear empty. By this it is manifest, that the more vehement the *Arteries* beat, it happens in all Fluxes of *Blood*, the whole Body is so much the sooner emptied; so in all Faintings, Fear, and the like, when the *Heart* beats weakly, and with much less Force, that it stops all Fluxes of *Blood*; hence likewise in a dead Body, after the *Heart* ceases to beat, you cannot extract out of the *Jugular* or *Crunal Veins*, or by opening of the *Arteries*, above half the Mass of *Blood*; nor can a *Butcher*, when he has knock'd down an *Ox*, draw all the *Blood* from him, unless he cut the *Jugulars* before the *Heart* leaves beating.

But if any remain yet unsatisfied, and object further, saying, That although by the

the cutting of an *Artery*, and opening a Way, it happens beyond the Course of Nature, that the *Blood* is forcibly expelled, yet it does not therefore happen in an entire Body where there is Passage given, and the *Arteries* are full and constituted according to Nature, that such a great Quantity should pass in the Vessels in so short a Space; so that there must needs be a Regress. I answer, That it appears from a former Calculation how much the *Heart*, being fill'd, contains more in its Dilatation than in its Construction, so much at every Pulsation is sent forth; and that Reason there is, so much pass the Body, being whole and constituted according to Nature. But in *Serpents*, and some *Fishes*, binding the *Veins* a little beneath the *Heart*, you shall quickly see the Distance betwixt the *Heart* and the *Ligature* to be emptied; so that you must needs affirm the Recourse of *Blood*, unless you will deny your own Eye-sight; we will confirm this with one Example: If you cut up an *Adder* alive, you shall see the *Heart* beat calmly and distinctly for a whole Hour, and contract and thrust it self out again like a Worm; if the *Vena Cava* enters the lower Part of the *Heart*, the *Artery* comes out at the upper Part; now taking hold of the *Vena Cava* with a Pair of Pinchers, or with your Finger and Thumb, and the Course of the *Blood* being stop'd a little Way beneath the *Heart*, you shall upon the *Pulse* perceive that Place to be almost presently emptied betwixt your Fingers and the *Heart*, the *Blood* being exhausted by the Pulsation; and that the *Heart* will be of a far whiter Colour, and that it is lesser in its Dilatation for want of *Blood*, and at last beats more faintly; so that in the End it seems as it were a dying, but as soon as the *Vein* is united, both the Colour and Bigness returns to the *Heart*: Again, if you leave the *Veins* free, and bind the *Artery* a little Way from the *Heart*, you will, on the contrary see that swell vehemently where tied, and the *Heart* Tumefied as ready to break, which acquires a Purple Colour, till it be blackish, so that it is at last oppressed with *Blood*, and ready to cease its Motion; but untying the String, it returns to its natural Constitution, Colour and Bigness; so that there seems to be Two Sorts of Death, Ex-

inction through Defect, and Suffocation, by abounding with too great Quantity of *Blood*; both which are demonstrable to our Eyes.

The next Thing to be taken Notice of are some Experiments, by which it will appear clear that the *Blood* doth enter into every Member through the *Arteries*, and returns by the *Veins*, and that the *Arteries* are the Vessels that carry the *Blood* from the *Heart*, and the *Veins* those by which the *Blood* is returned to the *Heart* it self; and that the *Blood*, in the Members and Extremities, passes from the *Arteries* into the *Veins*, as before it did in the *Heart* and *Thorax*, out of the *Veins* into the *Arteries*; whence it is manifest, that in its Circulation it moves from the Centre to the Circumference or Extremities, and from thence again to the Centre.

I shall mention something of Ligatures here, and then speak of the Experiments performed by them: Some Ligatures are strict or hard; others gentle, or of a middle Sort: A strict Ligature is such a one where the Arm is so straightly bound with the Bandage or Fillet, that you cannot perceive the *Artery* beat any where beyond the Ligature: Such a one we use in the cutting off of Members, taking away of Tumours, stopping Fluxes of *Blood*, &c. I call that a gentle or middle Sort of Ligature, which compresses the Member every Way, but without Pain, so that it suffers the *Artery* to beat a little beyond the Ligature; such a one is used in *Blood-letting*, for though you make the Ligature above the Elbow, yet you shall perceive the *Arteries* a little in the Wrist, if you touch it, and the Ligature be made aright. Now if you make an Experiment upon a Man's Arm by binding, as in *Blood-letting*, or by the stronger Grasp of the Hand it self, which is better perform'd in a lean Body that has larger *Veins*; when the Parts are heated, a greater Quantity of *Blood* is in the Extremities, and the *Pulse* is quicker, for then every Thing will more evidently appear. If then you make a hard Ligature, drawing it as straight as can be endured, you may first observe, that beyond that Ligature the *Artery* does not beat in the Wrist, nor any where else; and then that immediately, that the *Artery* a-

bore.

bove the Ligature has its *Diafole* higher, and beat more violently, and as it were with a kind of Tide, rises towards the Ligature, as if it endeavour'd to beat through; in the mean Time, the Hand retains its Colour, only in Time it begins to be a little coldish. After this Ligature has continued a while, and comes on a sudden to be unloosed and tied gently, as in *Blood-letting*, it is to be observed, that the whole Hand is presently supplied with Colour, and distended, so that the Veins become swelled and knotty, and that in the Space of Ten or Twelve Pulses the Hand appears extremely full, a great Quantity of Blood being let pass by the Ligature without either Anguish or Heat; in the mean Time, if you put your Finger upon the Artery at the very Time of Unbinding near the Ligature, you shall feel the *Blood* as it were passing under your Finger.

Moreover, he in whose Arm the Experiment is made upon, the Change of a streight Ligature into a gentle or moderate one, shall plainly feel the Heat and Blood enter by Pulsation, and disperse it self all over his Hand, as in a strict Ligature the *Arteries* above are distended and beat, and not below; the *Veins* become less; so in a loose Ligature the *Veins* swell, and become stubborn, and the *Arteries* become less; nay, if you squeeze the *Veins*, unless you do it very strongly, you shall hardly see the Blood pass above the Ligature, or the *Veins* fall: Hence it appears why in *Phlebotomy*, when we would have the *Blood* leap out further with greater Force, we bind it above the cutting of the *Vein*, not below; but since it is driven by the *Arteries* into the lower *Veins*, in which Regress, by reason of the Ligature, the *Veins* swell and can squeeze it out, and throw it further through the Orifice, but the Ligature being untied, and the Way of the Egress being open, the Blood no longer comes but Drop by Drop: If in *Blood-letting* you untie the Band, or bind it below, or else bind the Member with too strict a Ligature, it will not issue out, as if all the Force were taken from it, because the Way of Entrance, and Influx of Blood through the *Arteries*, is by that strict Ligature intercepted, or a freer Regress

is granted through the *Veins*, the Ligature being untied.

Granting these Things to be so, it is certain that the *Blood* continually passes through the *Heart*; for we see in the Habit of the Body, that the *Blood* flows constantly out of the *Arteries* into the *Veins*, and not out of the *Veins* into the *Arteries*; so that the whole Mass of *Blood* may be drawn from the Arm by opening a *Vein*, if the Ligature be well made, and we may see it run so forcibly, that it is certain all the *Blood* in the Body may be evacuated this Way, as well from the *Veins* as the *Arteries*; wherefore we must own that it is driven by Force or Impulsion, which proceeds from the Pulse of the *Heart*, and the Constriction or Vibration of the *Arteries*.

Now it is apparent, that this *Flux* comes from the *Heart*, and that it flows by a Passage made through the *Heart* out of the great *Veins*, seeing below the Ligature the *Blood* enters by the *Arteries*, not by the *Veins*, and the *Arteries* never receive out of the *Veins*, unless it be out of the Left Ventricle of the *Heart*. Nor could so great a *Blood* be drawn out otherwise be drawn out of the Body, making a Ligature above so easily and quickly, unless perform'd by the impelling Force of the *Heart*. If any one therefore suffer such an Effusion of *Blood* for half an Hour, no Body needs doubt but that the greatest Part of it is exhausted, Faintings and Swoonings would follow; and not only the *Arteries*, but the greatest *Veins* would be likewise emptied: Therefore it stands to Reason, that in half an Hour's Time, so much *Blood* passes out of the great *Vein* through the *Heart* into the *Aorta*. We may further observe, That in *Blood-letting*, if you tie the Arm, and make a convenient Orifice, yet if Fear, Swooning, or any other Cause intervene through Passion of the Mind, so that the *Heart* beat more faintly, the *Blood* will not flow, except Drop by Drop; and the Reason is, because the *Pulse* being faint, and the impelling Force but weak, the *Blood* cannot open it self a Passage out of the *Veins*, or the *Heart* propel it through the *Lungs*.

If now that we explain which Way the *Blood* flows back from the Extremities thro' the

the *Veins* into the *Heart*, and how the *Veins* are the Vessels that carry it from the Extremities to the Centre, by which Means we think those Three Propositions will be sufficiently evident; and this is plain enough, from the *Valves* or *Portals*, which are found in the Concavities of the *Veins*, their Use, and from ocular Demonstration. The Famous *Fabritius ab Aquapendente*, an accurate Anatomist; or, as the Learned *Riolan* will have it, *Jac. Silvius* first of all delineated the Membranal *Portals* or *Valves* in the *Veins*, being in Form of a Σ , or Half-Moon, the most eminent and thinnest Parts of the inward Tunics of the *Veins*; their Situation is in distant Places, after a various Manner; in divers Persons they are connate at the Sides of the *Veins*, looking towards the Roots of them; and in the middle Capacity both of them looking towards one another, equally and duly touching one another, so that they are apt to stick together at the Extremities, and be united: And lest they should hinder any Thing to return from the larger *Veins* into the little Branches, or from the greater into the less, they are so placed that the Horns of the hindermost are stretched towards the middle of the Body of it, which is before, and so interchangeably.

The Discoverer of these *Valves* did not understand the Use of them, nor those who said they were made to hinder the Blood by its Weight from falling downwards; for there are in the *Jugular Veins*, those that look downwards, and hinder the Blood from being carried upwards: There are since found in the *Emulgent Veins*, and Branches of the *Mesentery*, those which look towards the *Vena Cava* and *Vena Porta*, but there are no such in the Arteries; and it is to be observed, that Dogs and Cattle have all their *Valves* in the dividing of the *Cranial Veins*, at the beginning of the *Os Sacrum*, or in the *Ilia* Branches, near the *Coxendix*; in which there is no such Thing to be feared, by reason of the upright Stature in Man; nor are there *Valves* in the *Jugulars*, as some say, for fear of *Apoplexies*, because the Matter is apt, in Sleep, to flow into the Head through the *Soporal Arteries*; nor that the Blood may stand still in *Divarications*, and that all the Blood should not break into the small Branches

or those which are more capacious; for they are likewise placed where there are no *Divarications*, though I confess they are more frequent where there are *Divarications*; nor that the Motion of the Blood may be retarded from the Centre of the Body; but the *Valves* were merely made, lest the Blood should move from the greatest *Veins* to the lesser, and that it should not go from the Centre of the Body to the Extremities, but rather from the Extremities to the Centre; therefore by this Motion the *Valves* are easily shut, and hinder any Thing which is contrary to them.

I have often tried that in Dissection, if beginning at the Roots of the *Veins*, I put in the *Probe* towards the small Branches with all the Art I could contrive, it would go no further than the next *Valve*; on the contrary, if I put it in from the Branches towards the Root, it passed very easily. In many Places, Two *Portals* or *Valves* are so interchangeably placed and fitted, that when they are elevated in the middle of the Concavity of the *Vein*, they close with one another to a Hair's Breadth, and in their Extremities and Convexities are united and interchangeable: that you can neither see with your Eye, nor any Ways discern either Crack or Conjunction: On the contrary, from putting in a *Probe* out of the Branches towards the Trunk, they easily give Way, and like those Gates or Sluices by which the Course of Rivers is stop'd, are easily turn'd back to intercept the Motion of the Blood from the *Vena Cava* and the *Heart*, and being closely lifted up in many Places, whilst they are interchangeably shut, they quite hinder and suppress, nor by any Means suffer the Blood to move, either upwards to the Head, or downwards to the Feet, nor to the Sides or Arms, but stop and resist all manner of Motion of the Blood; which is begun in the greater *Veins* and Ends in the lesser, yet readily obey any which is begun in the small *Veins*, and ends in the greater.

But that the Truth may the more clearly be shown, let the Arm of a Man alive be tied above the Elbow, as if it were to let Blood, there will appear in Country People, and especially those who have swollen Veins, little Knots or Swellings; and these Knots are

made by the *Valves*: They thus appearing in the inside of the *Hand* or *Cubit*, if you draw down the *Blood* with your Thumb or Finger from the Knot, you will see that none can follow, the *Valve* quite hindering it, and that the Part of the *Vein*, drawn down betwixt the Swelling and the Finger, is quite obliterated, and yet full enough above the Knot or *Valve*; nay, if you do retain the *Blood* so drove down, and the *Blood* emptied, and press down with the other Hand the upper Part of the *Vein*, you shall find that it can by no Means be forced or driven beyond the *Valve* or *Portal*; but how much more you endeavour to do this, so much the more you shall see at the *Valve* the *Vein* swell'd and distended. Hence, since a Man may make Experiments in many Places, it appears that the Function of the *Valves* in the *Veins* is the same as that of the *Sigmoides*, or Three-pointed *Portals*, which are made in the Orifice of the *Aorta*, or *Vena Arteriosa*; to wit, that they may be closely shut up, lest they should hinder the *Blood* to return back again.

Besides tying the Arm again as before, and the *Veins* swelling, if you hold the *Vein* below any Swelling or *Portal*, at any Distance, and afterwards with your Finger drive the *Blood* upwards above the *Portal*, you shall see that Part of the *Vein* remain empty, and that it cannot return by reason of the *Portal*; but taking away your Finger, you shall see it again fill'd by the lower *Veins*; so that from hence it appears plainly, that the *Blood* does move towards the upper Parts, and the *Heart* in the *Veins*, and not on the contrary. And though in some Places which are not closely shut, or where there is but one *Valve*, the Passage of the *Blood* from the Centre seems not to be quite hindered, yet for the most Part it appears so, or lest that which is negligently perform'd in some Places, is recompens'd by

the *Valves*. This is further to be observed, tying the Arm as before, and the *Veins* swell, and *Knots* or *Valves* appearing, if below any *Valve* in any Place where you find the next, you Place your Finger which may hold the *Vein*, that no *Blood* go from your Hand upwards, then squeeze with your Finger the *Blood* from that Part of the *Vein* above the *Valve*; then taking away your Finger, suffer it to be fill'd up by those under, and then pressing again with your Thumb in the same Place, squeeze out the *Blood*: Now you may do this a Thousand Times in a little Space: And if you compute how much by one Compression moves upwards by pressing of the *Valve*, and multiplying that by Thousands, you shall find so much *Blood* pass'd by this Means through a little Part of a *Vein*, so that you will find your self perfectly perswaded concerning the Circulation of the *Blood*, and of its swift Motion.

Seeing then it is confirm'd by Reasons and evident Experiments, that the *Blood* does pass through the *Lungs* and the *Heart* by the Pulsation of the *Ventricles*, and from thence is driven into the whole Body, and creeps into the Capillary Vessels, and through them returns by the little *Veins* into the greater; from the Circumference to the Centre, from whence it comes at last into the *Vena Cava*, and into the Auricle of the *Heart*, in so great Plenty, with so great Flux and Reflux from hence through the *Arteries*, and from thence through the *Veins* again; it must of Necessity from these Things be concluded, that the *Blood* is driven round by a *Circular Motion*, and it perpetually moves; hence arises the Action and Function of the *Heart*, which by Pulsation it performs; and lastly, That the Motion and Pulsation of the *Heart* is the only Cause.

Of the Motion of the Blood, Sanguification and Nutrition, &c. From James De Buck, Physician in Ordinary to the Town of Rotterdam.

Blood is an Humour familiar to the Nature of Animals, contain'd in the *Veins* and *Arteries*, being compos'd of Materials fit for the Nutrition of the Parts, administering Heat to the whole Body, together with Nourishment for the Support of Life. The Elaboration of this Humour is called *Hematosis* or *Sanguification*: This is perfected Two Ways; First, in the Habit of the Body, by an Universal Circulation; and in the next Place, by a Mixture and Addition of several Juices jumbled together, whereby the *Hematosis* is form'd, and the Animal is sustained, and receives its Increase. I think no Man will deny the Name of *Blood* to this Humour, which is fit for a tender Body whilst it is White, and has not as yet requir'd Redness for an Aptness of Nutrition, and not Redness makes the *Blood*, the Blood of many Creatures not being Red.

The Nutriment being received, and a little imbrued with the *Saliva* or Spittle, that it may the easier receive the Moisture of the Mouth, it is sent into the *Oesophagus* or *Gullet*, and by the Help of its *Muscles* and *Fibres* down into the Stomach, where it is watered with what issues out of the inner *Tunicle*, and being mix'd by the Force of the Stomach, is jumbled together as much as it can be: The aforesaid *Tunicle*, the more it is distended, seems to be the thinner, and the Pores of it more open, and so on the contrary; wherefore there is a great Quantity of this Moisture poured in when it contains any Thing in its Capaciousness or Distention, which is to be diluted, than when it falls, for then it is thickened, and the Necessity of Dilution is not so pressing. I do not believe that in any natural Operation the Colour or Consistency of a Thing has been chang'd without the Addition or De-

traction of Substance; though I believe that Heat furthers Digestion, so that it congregates Homogeneousals, and disgregates Heterogeneousals; although Fishes, whose Internals and very *Blood* is cold, digest their Food, being swallowed down whole, and are Ravenous without Measure: This is very conspicuous to our Senses, for if we look but into the Stomach of a Fish of common Size, when he has swallowed another for Food, whose Body, because it is not all at one Time consumed in Digestion, but the External Parts, and those that are nearest the bottom of the Stomach, after a little while, we shall see the Reliques of the Fish swallowed, and about them the Part digested; and near the Sides of the Stomach a certain Juice, just come out of the Pores or Glands of the inward *Tunicle* like Sweat, that being more diluted than that which appears almost digested, it might be thrust into the Gut, through the *Pylorus*, by the Force of the Contraction of the Stomach.

But lest any one should think this is done by Drink, it is certain that it is likewise mix'd with this Juice before it goes out of the *Ventricle*, but that it needs not so long Time for it, because sooner, and rather soft and liquid Things are digested than gross Things: for being vomited up a while after it has been receiv'd, it appears thicker and more Slimy, unless the Stomach be diseas'd, and be weak of Digestion, then it comes up thin and sour; because all that goes in wanting that favourable Juice, becomes sour, and is corrupted. Most attribute this sour Juice to the *Spleen*, but without Reason, since nothing is carried from it to the Stomach; neither Mucous, nor a thin Humour or sharp acid Juice to further Digestion, or provoke Appetite, or for any other Cause; the Reason is, because there is

no Way, nor no immediate Passages, from the *Spleen* into the *Stomach*.

It is a hard Thing to say whether any Thing be carried from the *Spleen* to the *Stomach*, though there are several Learned and Judicious Men do think that the smaller Portion of the *Chyle* insinuates it self into the Pores of its *Tunicles*, and that being drawn together by the *Blood* returning, it is led through the small Branches of the *Gastrick Veins* into the *Spleen*, and mix'd with the *Blood* passing out of the abundance of *Arteries* in that Place into the *Veins*, and mix'd with the Heat of the *Spleen*, that it flows through the Splenick Passage, with the Hemorrhoidal Blood, into the *Vena Porta* and the *Liver*: But since these Things are obscure, we shall neither confirm or contradict them. The *Tunicle* of the *Stomach* seems to be so much taken up in emitting of Moisture, that I suspect it cannot serve Two Motions so contrary, as to emit from the Pores of the *Tunicle* into its Cavity, and out of its Cavity into the Pores of the *Tunicle*, at one and the same Time; especially since it stays to be made *Chyle* there. It proves nothing that in a living Creature, tying the *Veins* which go to the *Spleen*, they swell that Way, for this is common to all *Veins* which are tied, to sink towards the larger Trunks, and swell towards the Branches.

As to the *Gastrick Veins*, being grafted into a Branch of the *Splenick*, whilst it is yet hid in the *Spleen*; the *Blood* which is sent through them does not touch the Substance of the *Spleen*, only is mix'd with that which comes out of it, and with a quick Motion is carried into the *Porta* to dilute the *Chyme* which there it meets with, coming out of the *Glandules* of the *Mesentery*. I think that the *Spleen* was made for this Use alone, that it may deposite into the *Porta* that *Blood* which it receives in abundance from the Branch of the *Celiac Vein*, being first strain'd through its thin and spongy Substance, that it may there dilute the *Chyme*, which is but little in regard of the *Blood* which flows to it, with its Abundance, together with that which returns from the Nutrition of the rest of the Bowels; which is so necessary, that when the *Spleen* is obstructed, and the Passage of *Blood* is stop't, and the *Chyme* is

not well diluted, the whole Body, by Depavation of the Nutriment is extenuated, and the *Spleen* swells into a greater Bulk by the Stagnation of *Blood*.

After the *Chyle* is passed into the *Intestines*, the grosser Part is always moved further by the Peristaltick Motion; but that which is thin is squeez'd through the Glands of the Guts as their Strainers, and to Vessels proper for its Reception, which are called the *Lacteals*; and these opening themselves in the midst of the Bowels, do receive this White Liquor like Milk into them, and then endeavouring to free themselves from Distention, the others move it forward to be refined in the *Glandules* of the *Mesentery*, and this into the *Pancreas*; the *Chyle* being pals'd by these Vessels, the *Chyme* is squeez'd out of it by the forcible Contraction of the *Intestines*, and the compressive Weight of the Bowels lying upon it, as also by the continual Motion of the *Muscles* of the *Abdomen*, and is received by the *Vena Lactea*, to be deposited in the *Glandules*; whence, being turned into *Blood*, as aforesaid, it enters into the *Capillary Veins*, out of which sliding it is diluted, by great Store of *Blood* flowing every where from the *Vena Porta*, but especially from the *Spleen*, destined for that Purpose.

Chyme is the strained Juice which is separated from the grosser Substance of the *Chyle*, and is the same Matter which is contain'd in the *Vena Lactea*; and it is supposed that this, after it is passed the *Adenes* of the *Pancreas* and *Mesentery*, and received into the little Branches of the *Vena Porta*, may very well be called *Chyme*: To this *Chyme* answers that Preparation of the *Blood* in the *Placenta*, whilst the Birth is yet in the Womb, in which a Juice descending from the Body of the Womb, is diluted with *Blood* brought through the *Umbilical Arteries*, both for Nutrition, as likewise for the Performance of this Work, and is mix'd, and then acquires the first Disposition of *Blood*. Afterwards the *Bile* or *Choler* is added to the *Blood* which was thought by all the Ancients to be an Excrement, as being contrary to the Nature of Animals, which delight in sweet Things, and are nourished by them. The *Biliary*, or *Gall-Bladder*, consists of a Membranous Substance, which may be contracted and

extended. Besides that which is common to the Entrails, it has a strong *Tunicle* of its own, strengthen'd with all Manner of *Fibres*. The narrow Neck of this Bladder stretch'd out in Length, makes up the Biliary Passage, call'd the *Ductus Cholidochus*. In this are placed *Valves*, which, besides hindering any Thing from entering into the Bladder thro' this Passage, stop the Return of the *Choler* after it is once out; which appears, when with our Fingers we endeavour to squeeze back which we have press'd out of it, for we can by no Means thrust it back again.

This Passage is divided into two Tracts, of which the one being first divided into two, then into more, and afterwards into many Springs, passes through the *Liver*, that the *Gall*, being divided into very little Parts, may be moved forward into the *Vena Cava*, passing through the *Liver*, together with the *Blood* that flows from the *Vena Porta*. The other going further, is obliquely grafted into the Beginning of the *Jejunum*, being drawn down betwixt both the *Tunicles* of the *Intestines* about the Length of two Inches, so that it makes one Hole in the Gut, together with that which runs through the *Pancreas* through the aforesaid Passage, or being pass'd through the Hole to the *Vena Lactea*, to be prepared with the Juice of the *Chyle*.

It seems to me absurd that two Liquors should meet without Mixture, that the *Intestines* should squeeze out the grosser, and the *Vena Lactea* receive it, and yet not receive that which is thinner. It is fit that the *Gall* should be added to this insipid and sweet Liquor, both that its Sharpness and exceeding yellow Colour might be temper'd with this crude white Juice, as likewise that its dull Inactivity might be put in brisker Motion. If the other, that is, the Passage which goes to the *Intestines*, be stop'd, or by external Compression be so streighten'd that the Way of the Bile to the *Intestines* be hinder'd, it is by another Passage convey'd into the Mass of *Blood*, and turns the whole Body yellow. From hence I am satisfied, that the *Choler* or *Gall* is not an Excrement of the *Liver*, but being made for a better and more common Use, it is first collected in the Bladder, and in due Time is both mix'd with the *Chyle* and the *Blood*. Thus

we affirm, that the *Blood* being alter'd with these divers Mutations, and mix'd with that in the *Vena Cava*, which returns from the whole Body, is alimentary, and fit for the Nutrition of all the Parts, being distributed to them by proper Vessels appointed for that Use.

That the *Blood* may be turn'd into Nourishment for the Body, there are two Things very necessary, Motion and Pressure, by the Help of which, it may flow or be mov'd to those Parts which are to be nourish'd. Since this does not depend on the *Blood*, but is different from it, as that which moves from that which is moveable, it contributes nothing to the *Hematosis*. Indeed, this Fluxibility or Motion appertaining to its Constitution, ought to arrive from Sanguification, and be reducible to the *Hematosis*. The *Serum* or Air that is mix'd with the *Blood*, make it moveable: By the former, the Members are made flaccid, soft and unactive; by the latter or aerial, the solid Parts are render'd more robust and vigorous. And though *Serum* is necessary for the Augmentation and Nutrition of the tender Parts of an *Embryo* in the Womb, when it grows bigger, besides that Nature in requiring Aliment wants Air, it has likewise need of it to facilitate the Motion of the *Heart* and *Brain*; for they are moved continually and agitated by an alternate *Systole* and *Diafole*; nor are they hinder'd by the Birth being tender, for the whole *Breast*, with the *Heart*, *Brain*, and *Cranium* it self, cover'd with a Film, rises and falls again. The Members growing solid in Time, the Bones daily acquire a greater Degree of Hardness, and are more resisting to the Motion. In the meantime, the Strength of the Body, and the *Heart* growing, the Pulses and Motion of the Brain become greater, which Discord going on, it comes to pass, that the Birth being instigated by a Necessity of freer Motion, is incited to change Place for more Air, and so the Delivery is hasten'd.

The Infant coming into the World, it is seriously to be observed, that the *Blood* is moisten'd, and made more subtile by the Attraction of the Air, whence the Excrements, which in Time of Gestation were but few, are augmented, and the serous Humour, that is of less Importance to its further Nutri-

tion, is voided in greater Plenty; so that it is observable, that an Infant born without an open Passage for Urine or Excrement, will die in a short Time. By the Consideration of these Things, I am perswaded, that neither this *Blood*, or any other which is contained in the *Veins*, is fit for the Nutrition of the Parts, unless being mix'd with a due Proportion of Air, and so enliven'd, it can be admitted into the least Part of them; for Nutrition is not made by external Addition, but when the Nourishment is fitly adapted not only to every Part, but duly to every little Portion, and so assimilated to it. It is clear enough, that this Fluxibility is given to the *Blood* by the *Air*, being a moist thin Body, and proper for Motion. But if it be objected, That it is only necessary for the Motion and Cooling of the *Heart*; the Answer is easily given from the Example of Fish; for though they are always cold, they still draw up Water at every Pulse of their *Heart*, and send it out at their Gills, with which they might be both satisfied for the Motion of their *Heart*, and for Refrigeration, if they needed any such; yet to them is assigned a little *Bladder*, in which they carry *Air* along with them, that they may stay under Water, and not always be forced to swim at Top to take in the *Air*; for if being taken with a Net or Weed, they be kept long under Water, and hinder'd from breathing, the *Air* in their little *Bladder* being spent, they are suffocated and die.

Columbus, a famous Anatomist in his Time, was the first who was of Opinion that the Mixture of the *Blood* with *Air* was perform'd in the *Lungs*, and that this *Blood* was made vital; for considering the Capaciousness of the *Vena Arteriosa*, he thought it was appointed for some other Use than to carry Nutrition to the *Lungs*; for (says he) if the vital *Blood* is not brought to the *Lungs*, it is created in it, but is not given to it from any where else; for it has no Branch from the *Aorta*, nor by the *Arteria Venosa*, which, by reason of its *Valves*, receives no *Blood* from the *Heart*; for if it did, it would beat: Therefore it follows that it is bred there, since live Dissections demonstrate that the *Arteria Venosa* is full of *Air* as well as *Blood*, and is without *Pulse*. Now there is always *Air* ready in the *Lungs*, and they are

properly form'd for such a Reception; for their *Flesh* is soft, light, thin and spongy, and so interwoven with different Kinds of Vessels, that it is render'd full of Holes like a Sponge.

There is required in the Action or Production of Heat in the living Creature, first Motion in the *Blood*, then something to move it, and lastly a Disposition of the Ways or Passages through which and to which, as to Bounds, it may be mov'd and contain'd. It has its Motion partly from the *Serum*, but chiefly from the *Air*, which is added to the *Blood* in the *Lungs* by the Mediation of this, that it being divisible into infinite Parts, can pass through all, even the thickest Parts. There is so great an Affinity betwixt Divisibility and Motion, that the more easy a Thing is ordained to be divided into less Parts, it is so much the more moveable, Motion being absolutely necessary to the *Blood* for distributing of Nourishment; for Nutrition is the Union and Assimilation of the nutritive Humour to every Part, which Nutrient, that it may become one living Thing, together with that which is to be nourished, is not perform'd by external Apposition, but it ought so to pass the least Particles of the Members, that, according to all their Dimensions, it may be added and united to them.

It is likewise to be observ'd, that all that is brought thither is not united, since the self same *Blood* has various Parts in it, of which some are most fit and apt for this Part, and other some for another Part, yet none stick to them (being oppos'd) but those that have a Resemblance with them, the rest being unfit, return to the *Veins*. If there be a greater Quantity added than is exhausted, there is made an Accretion; but if a Part that did adhere before, be carried away with it, there happens an Extenuation of the Parts. The very Way of its Preparation shews the Motion of the *Blood*; for no Part of *Chyle* is admitted into the *Lacteals* but the thinner and more agile Part of it, which, after it has first pass'd the Glands of the *Mesentery* and the *Pancreas*, and mixed with a little *Bile*, it is at last impregnated with the finer Particles of the *Air* in the *Lungs*, to give it its requisite Perfection.

This Motion of the *Blood* is not sufficient alone to the Production of Heat; for unless it be driven by some impulsive Force, and be agitated with a swift Motion, it should never become hot; and though the *Blood* be disposed to Motion, if it be destitute of vital Spirits, it is no ways able to move it self, and these vital Spirits chiefly affect or act upon the Heart, which having large and springy *Fibres*, readily contract and thrust out the *Blood* received from the *Auricles* into the *Arteries*, without any other Intention but to ease it self of that heavy Burthen, with such frequent and swift Pulsations, that from them, and likewise by comparing the Contractions and Dilatations of the Heart, the Greatness of the Flood-gates, and the Elevation sensible to the Touch of all the *Arteries* through the whole Body, one may by Conjecture easily gather how swiftly, by a continual Motion, the *Blood* passes through all the Parts.

The *Arteries*, and all the Parts, second the Heart in this Motion, they being fill'd and swell'd by the Force of the Action of the Heart, when they are contracted and oppress'd by a Weight of the neighbouring Part, as the *Pulmonary Arteries* into the *Lungs*, and the *Aorta* into the whole Body. Let no Man therefore suppose, because the *Blood* leaps out by the impulsive Action of the Heart in the *Diafole* of a wounded *Artery*, that the *Blood* has all its propulsive Force from the Heart, and that the *Arteries* contribute nothing to it, because it seems to leap out when they are fill'd. It will not from thence be concluded, that the *Blood* in the *Systole* of the *Arteries* does not move farther, for they fall and are contracted, that they may rise again in their *Diafole*; and though at that Time the *Blood* does not flow out of them with so great Force as to leap, yet it slides out of them as out of a *Vein*, and as much as the closing Lips will suffer to flow forth.

It appears how much Power the *Arteries* have in Protrusion of *Blood* by the Ligature; for no sooner by it, may even the great *Artery* be tied, but immediately beyond the Ligature it is emptied in the Space of three or four Pulsations, although by Hindrance of the Band there proceeds no impulsive Force

from the Heart. The Parts which make up the Ways through which the *Blood* may pass, and in which, as in Bounds, it may be contained, and its Heat preserv'd, are the Heart, the *Arteries*, the *Pores*, and the *Veins*, with their *Appendices*. The *Vena Cava*, with its *Auricle*, the right *Ventricle* of the Heart, and the *Pulmonary Artery*, make up one Passage together, as the *Vein* of the *Lungs*, and the *Auricle* fasten'd to it, and the left *Ventricle* of the Heart, with the *Aorta*, make up another. Either of these is joint and undivided, apparent to the View, only in most Places it is clos'd with *Valves*, hindring the Regress of the *Blood*. There are a great many of these which are connate in the Concavities of the *Veins*, both because there is an Inequality in the Motions of the Body, as likewise because by outward Compression they easily yield, from the Softness of their *Tunics*, whence not only the Motion of the *Blood* might be hinder'd, but to the great Damage of the Body, it might be press'd backwards, unless that were prevented by Nature with *Valves*.

These are framed at the Entry and Egress of the Heart only for the first Reason, to wit, because the Motion of the *Auricles*, Heart and *Arteries*, is not the same, but different. There is none granted to *Arteries*, because at one Push they are elevated by the Action of the Heart, and when that ceases, they are likewise contracted and fall; next, because of the Hardness of their Substance, they are not so easily squeez'd together by the Weight of the Parts adjoining. In these Passages, the *Blood* gains nothing from the Heart or *Arteries* but a swifter Motion; all that it has, is added to it by the *Veins*. The Beginning of these describ'd Passages begin together with the *Veins*, and like Marks or Bounds, end together with the *Arteries*, both which Parts are similar, so call'd, because they have a Similitude one to another, and any Part of them is call'd by a like Name, a *Vein*, or an *Artery*: Therefore wheretoever they are so ingrafted into the Substance of the Parts, and are so entangled with many Divisions and Divarications, that they quite lose both Name and Similitude, they are taken for Substance, which flows thither for Nutrition of the Parts.

Whether Harvey thought that the Ventricles of the Heart were so expanded in the Systole that they might receive Blood, and so shut up again in the Diastole as to thrust it forth; that such a Sequel did follow from the Supposition of Cartesius. By the same Author.

I SEE no Reason why the Famous *Des Cartes* should say that the Venerable *Harvey* thought that the *Ventricles* of the *Heart* dilated in its *Systole* that they might receive Blood, and were straighten'd in the *Diastole* that they might propel it into the *Arteries*. *Des Cartes* thinks, that the *Heart*, by reason of the Ebullition of Blood rais'd by its implanted Heat, swells and rises into *Diastole* at that Time when the Breast is struck, and the *Pulse* may be felt outwardly. *Harvey* says, that the *Heart*, at the same Time that it strikes the Breast, stretches all the *Fibres*, erects it self, is on all Sides contracted, and is in its *Systole*. The same Time in which one says there is a *Systole*, the other says there is a *Diastole*.

Is it fit for *Des Cartes* to ascribe that to *Harvey* which is against his Opinion? As if he had said, that the *Heart* was dilated, and received Blood in the *Systole*, because *Des Cartes* is of Opinion that the *Systole* is at that Time, though he affirms and demonstrates that the *Diastole* is then made. *Harvey* by the same Right might say the like of *Des Cartes*. But let us examine whose Opinion is best.

Harvey, who was an exquisite Anatomist, observ'd two distinct Times in the Motion of the *Heart*, to wit, one Time of Motion when the *Heart* moves it self and is in Action, and another Time of Rest, in which ceasing from Action, it is moved and extended by the Immission of Blood from the *Auricles*. He says, that these Times may be more manifestly distinguish'd and accurate-

ly observ'd in colder Creatures; yet in hottest Creatures, the best Observations are to be taken when the *Heart* begins to die, and beat more slowly and faintly; for then the Rests are longer, which in a vigorous and lively *Heart* can hardly be discern'd: Then likewise the *Heart* is seen, after the Performance of its *Systole*, to be at Rest, and to be, viz. in the Creature departing, loose, flagging, weaken'd, and lie as it were drooping.

* He says, that the *Auricles* at this Time do stretch and contract themselves, and by Impulsion drive the Blood into the *Ventricles*, in the Distention of which they make a *Diastole*; which being done, that is to say, when it is extremely distended, begins the Motion of the *Heart*, at which Time contracting it self every Way, and leaning upon its *Basis*, it is erected, and being lesser in Quantity, and oblong, it lifts up its Point, and strikes the Breast. He calls this Time the *Systole*, the former the *Diastole*. The first begins when the *Heart* is emptied and rests from its Work, and leaves off when the *Heart* is full: The other begins when the *Heart* stretches all the *Fibres*, and contracts them, and ends when that Work is finish'd. Let any Man then judge if *Harvey* be of Opinion that the Blood in the *Systole* is received into the dilated *Ventricles* of the *Heart*; and thrust out into the *Arteries* in the *Diastole*, when they are straighten'd, especially since the Matter being yet in Controversy, it is not determined whose Opinion is the best.

Let us examine *Des Cartes's* Opinion of the *Systole* and *Diafsole*, and try whether or no that will follow from his own Writings clearly, which he carps at in others. Seeing the *Diafsole* and *Systole* have their Times in which they are measured, and are mutually distinguish'd one from another, let us see how the Beginning of one, and the End of the other, can be discern'd from his Supposition. We know the Difference of the *Systole* and *Diafsole* by our Touch only, which is most usual in the Pulse of the *Arteries*, or merely by Reason. The first Way is, because the Extension of the *Heart*, as likewise of the *Auricles* and *Arteries*, is a *Diafsole*, and a *Systole* the Contraction of it. That Time which is nighest to the highest Extension, is of the *Diafsole*; as likewise, that is said to be of the *Systole*, which is next to the highest Contraction. The *Diafsole* begins, in the middle Way to Contraction it ends, the rest of the Time is ascrib'd to a *Systole*. The other Way, which is by the Help of Reason, is said by *Des Cartes* to begin when the Ebullition begins, when the *Heart* begins to swell with *Blood*; and the *Systole*, when in the Refrigeration of the *Blood* it falls again. Let it be taken how you will, it follows of Necessity, that the *Blood* in the *Systole* is admitted into the *Ventricles* of the *Heart*, and that it is sent abroad in its Dilatation or *Diafsole* into the *Arteries*.

In the first, there is no Doubt it remains that we demonstrate it according to the last Way, seeing he himself does not aver it openly, but says, as soon as two Drops of *Blood* are enter'd, t^hat is to say, into either of the Concavities, which are presently dilated and rarefied, by reason of Heat which they find there; for which Cause they make all the *Heart* swell, and do withal press upon and close the five *Valves* that are in the Entry, from whence they flow. *Des Cartes* seems to affirm, that the *Blood* is enter'd before the Ebullition begins; for (says he) after the Drops are enter'd, the *Blood* is rarefied, which makes a *Diafsole*; whence it is apparent, they came in in the *Systole*. The Consequence likewise teaches us, that the *Blood* enters into the *Ventricles*, when the *Valves* placed at the Heads of the *Veins* are open; but it goes out when they are shut, and those of the *Arteries* are open. But

Des Cartes opens the *Valves* of the *Veins* in the *Systole*, and shuts them in the *Diafsole*; therefore the *Blood* enters into the *Ventricles* of the *Heart* in the *Systole*, and not in the *Diafsole*.

Besides, he imagines that the *Arteries* come to be in their *Diafsole*, by reason the *Blood* entering is dilated, and that they have their *Systole* when it is refrigerated; wherefore in the *Arteries*, out of which the Causes of the *Systole* are deriv'd, the Times of its Entry and Condensation will be more distinct than in the *Heart*, from which the Cause is taken of its *Diafsole*, Entry and Dilatation. But what need we many Demonstrations? The Learned *Regius*, *Professor* of Physick in the University of *Utrecht*, and a notable Follower of *Des Cartes's* Philosophy, in express Words says, That the *Diafsole* is a Part of the Pulse, in which the *Heart*, by the rarefied *Blood* coming out of the *Vena Cava* into the right *Ventricle*, and out of the *Arteria Venosa* into the Left, in the *Systole*, according to its Depth and Breadth is dilated and swell'd; and a little after he continues, Nor is this Part of the Pulse to be accounted the *Systole* of the *Heart* from thence, because cutting away the Point of the *Heart* in a living Creature, the *Ventricles* of it are felt in this Case, and seem to be straighten'd; for the *Diafsole* of the *Heart* is not to be reckoned from the Dilatation of the *Ventricles*, but from the Swelling of the *Heart* it self, which may come to pass when the *Ventricles* are straighten'd. 'Tis therefore to be concluded, that *Des Cartes* determines that which he carps at in *Harvey*, to wit, That the *Ventricles* are dilated in the *Systole* that they may receive *Blood*, and are straighten'd in the *Diafsole*, when the *Blood* is thrust out into the *Arteries*.

May not *Harvey* with good Reason say, that *Des Cartes's* Opinion concerning the Motion of the *Heart* is destroy'd by his own proper Experiment, in which he strives to confute the Opinion of the Famous *Harvey*? And since we have gone so far to know the different Opinions of these two Eminent Men, it will not be amiss in comparing their Arguments, to see which of their Opinions is more plausible. It being received through all Ages, that the *Diafsole* of the *Heart* was then performed, when by

Extension like a Pair of Bellows, and drawing *Blood* into the *Ventricles*, it was said to be fill'd, and that that came to pass at such Time when it struck the *Breast*, and the Pulsation was felt outwardly. The Immortal *Harvey* observ'd, that at that Time there was not a *Diafole*, but a *Systole* perform'd; nor was the *Heart* dilated, or receiv'd *Blood*, when the *Heart* being at Rest, and desisting from its Labour, was extended by a greater Quantity, the *Blood* being thrown into the *Ventricles* by the *Systole* of the *Auricles*, the *Systole* being an Action of the *Heart* by which it thrusts out that *Blood* which it receives into the *Ventricles* into the *Arteries*, and raises them into a *Diafole*.

It is to be taken Notice^o of, says he, that the *Heart*, when it moves it self, is contracted and stretch'd like other Parts which are contracted in Action likewise, whence it comes to be of less Compass, which is both apparent to the Touch and Sight, because it is lessen'd, and is perceiv'd to be harder and more springy. He proves this Consequence by the Example of the *Muscles*, which, when they contract themselves, become harder and more resisting. Besides, the *Fibres* being contracted, are shorten'd and grow thicker, and so the Substance and Walls of the *Heart* are thicken'd at that Time. He proves, that the *Ventricles* are not fill'd with *Blood* at that Time, because they become narrower, and are more constricted and less capacious, as likewise they are seen to be emptied; for upon the giving of a Wound, the *Blood* comes out leaping, which is thrust out by the Contraction of the *Heart*. Lastly, the *Heart* becomes whiter, which, when it is fill'd, is flush'd with a red Colour, which is more apparent in Fish, and colder Creatures.

All the Parts, when in Action, are invigorated, but resting, are flagging and soft. In the Time of the Pulsation, the *Heart*, because it is in Action, is invigorated, contracted, and erects it self so much that it strikes the *Breast*. These are the Reasons from *Harvey*, by which induced, he endeavours to show there are two distinct Times for the Motion of the *Heart*; one, when contracting it self, it strikes the *Breast*, in which the *Systole* is perfected; another of its Rest, in which the *Diafole* is perform'd, and

the *Heart* is fill'd with *Blood* and distended. *Des Cartes* attributing no Action proper to the *Heart*, but affirming that its Motion is excited by no foregoing Power, but by the Heat which is implanted in it, that dilates the *Blood*, and raises its Ebullition, thinks, that the *Heart* is erected, and strikes the *Breast* from these Reasons. In a live Coney, says he, after the Top was cut off, the Basis of its *Heart* remaining still fast to its Vessels, did beat long enough, and in it I saw plainly those Concavities that are call'd the *Ventricles* of the *Heart*, become large in the *Diafole*, and narrower in the *Systole*. And a little while after, you must take Notice, that to perform this Experiment aright, you must not only cut away the very Point, but half the *Heart*, or more, and that you must essay this in a Coney, which is a fearful Creature, and not in a Dog; for in Dogs, the *Ventricles* have several Involutions, the Concavities of every one of which are so extended by the Dilatation of the *Blood*, that in the meantime the general Concavity of either of the *Ventricles* is more strengthen'd: And lastly, being taken hold of with the Hand, it feels a great deal harder in the *Diafole* than in the *Systole*. To these *Regius* adds, if at that Time the *Heart* and the *Arteries* be wounded, the *Blood* is seen to leap out from the swelling *Heart* and dilated *Arteries*. Besides, says he, at what Time the Impulse of the *Artery* is said to cease, at the same Time we see that Side of the *Heart* which looks towards the *Sternum* falls, and especially there where it answers to the Orifice of the *Aorta*; and the right Side and the left, towards the right and left Ribs, flags, the Point recedes from the *Basis*, and the whole *Heart* becomes loose, flagging and soft; but wounding the *Heart* and *Arteries* at that Time, no *Blood* comes from them, but their Wounds close.

These are the Demonstrations on both Sides: If then these Reasons are according to the first Way that was said how the *Diafole* and *Systole* sometimes might be distinguished, that is to say, if the *Diafole* be said to be when the *Heart* is exceedingly swell'd, and the *Systole* when it is less swell'd, the Arguments of *Des Cartes* and *Regius* will appear to infer something. But if you consult Reason, you shall find, that the *Systole* begins in the Height of the *Diafole*, to wit, when

when the *Heart*, extremely extended by the *Blood*, stretching or contracting the *Fibres*, thrusts it out into the *Arteries*; but it desists from this Action, when not being able to contract the *Fibres* any more, it loosens them, giving Occasion to a new *Diafole*, which begins when the *Heart* leaves Action, and is done whilst the *Heart* is quiet, and till it begin a new Contraction.

The *Diafole* and *Systole* being thus consider'd, a blind Man may see that the Opinion of *Harvey* is establish'd with the strongest Reasons; and that it must be concluded, that whilst the *Diafole* is perform'd, that the *Heart* is at Rest, that the *Ventricles* are fill'd and become larger, that the Walls are extended and grow thin, and that it self is augmented according to all its Dimensions; and that in the *Systole*, it moves it self by its own proper Action, it is invigorated by Contraction, the Walls of it are thicken'd, it self lessen'd, it advances its Point, the *Ventricles* are straighten'd, and by squeezing are emptied, the *Blood* is thrust into the *Arteries*, and in the mean time they advance themselves into a *Diafole*, at the same Time when the *Auricles* are erected.

These Things will appear plainer, if in a healthful or lively Body, you consider that the Sides of the *Heart* do not fall or flag, or grow loose and soft towards the right or left Sides, but that this happens only in dying Creatures; Examples of which *Harvey* alleges, that the Time of the proper Motion of the *Heart*, and its Rest, might be more evidently distinguish'd, and that he might easier demonstrate, whilst all the Actions are slow, that the *Heart* moves and contracts it self in the *Systole*, and rests from Action in the *Diafole*. By a sound Animal these Things are so quickly perform'd, that scarce has the *Heart* done its Contraction, but it is fill'd again, by the Urgency of the *Blood* through those open Ways, and Contraction of the *Auricles*, in the Twinkling of an Eye, and sometimes sooner, so that it is a hard Thing to discern the filling and emptying, if not impossible to do it. It is true, that at the same Time *Blood* leaps out of the

Wounds of the *Heart* and *Artery*, in the *Systole* of this, and the *Diafole* of that, by the Urgency or Contraction of the *Heart*; for this being empty whilst it is fill'd, and erected by the *Auricle*, altho' the *Blood* come out in the mean time, yet it comes not out with leaping, for the Action of the *Auricle* is not strong enough; then the *Ventricles*, which are empty, and must be fill'd again, hinder the leaping out of it; but the more forcible contractive Strength of the *Heart* makes the *Blood* leap out through both Wounds.

Let us to these subjoin our own Arguments, by which we think *Harvey's* Opinion may be further confirm'd. If the *Blood* was rarefied, and acquired greater Space in the right *Ventricle*, Nature ought to have given a greater Orifice to the *Pulmonary Artery*, which might be wide enough for the Passage of the *Blood*; the very Quantity which enter'd in the *Diafole*, ought to come out in the following *Systole*, the Bulk of which, if it be augmented, would need a greater Outlet, according to the Increase of the *Blood*, no less than we see the *Foramen* of the *Vena Cava*, by which it is join'd to the *Heart*, answers to the Bigness of the Part which is above the *Heart*, and likewise to that which is below the *Heart*. Moreover, it is certain, that according to *Des Cartes's* own Confession, the *Auricles* have a contrary Motion to the *Heart* when it is rais'd; and indeed at that Time when the *Diafole* of the *Heart* is according to *Harvey*, they are emptied, and fall; but when, by its Contraction, it strikes the Breast, they are fill'd, and swell. From these Things it manifestly appears, that it is to be concluded, that at that Time when it strikes the Breast, it moves it self by Contraction, it thrusts out the *Blood* into the *Arteries*, and is in its *Systole*; but when it desists from this Action, and is at Rest, it is fill'd with *Blood* and extended; the Cavities are made larger, the Sides made thinner, the whole is augmented, and in its *Diafole*, quite contrary to the Opinion of *Des Cartes*.

Of the Action of the Heart, and the Motion of the Blood called Circulation ; with several Material Things that depend thereon. From Diemerbroeck, Willis, Etmuller, Duncan, St. Hilaire, &c.

THE Action of the Heart is to receive the Blood from the Veins in the *Ventricles* ; to wit, That of the *Vena Cava* in the Right *Ventricle*, and that of the Pulmonary Vein in the Left, for the perfecting and subtilizing thereof, and for the better Distribution of it afterwards into all the Parts of the Body, which is perform'd by its Motion, which we call a *Pulse*. The Motion of the Heart is called in *Latin* *Pulsus*, the Pullation or Beating, by which the Heart raises or erects it self, or else swells and sinks alternately, or the Motion is made by *Diastole* and *Systole*, that is to say, by *Dilatation* and *Contraction*, there being a small resting Space betwixt the Two Motions.

The *Diastole* is a Lengthening of the Heart ; the Motion called *Dilatation*, being made when the Blood pressing the Sides of the *Ventricles* to enter, forces the *carneous Fibres* to stretch out lengthways, and when the Point is extended from the *Basis*, the Heart becomes much longer, and its Cavities larger. The *Systole* is the Return of the Heart, the Motion of *Contraction* being made when the same Fibres which were lengthened by the Blood that enter'd into the *Ventricles*, contract and squeeze the Blood into the *Arteries*, which dilate as it enters, and when the Point or Cone of the Heart approaches nearer its *Basis*, it becomes shorter, and its Cavities narrower.

The *Dilatation* is made at the same Time in the Two *Ventricles*, and the *Contraction* after the same manner. The rest, which is betwixt the Two Motions of the Heart, and in the *Arteries*, is called the *Perisystole*. When the Heart contracts it self, the Cone approaches the *Basis* in a streight Line, and the External Fibres descend from the *Basis*

toward the Point, and run again from the *Basis* where they end, bringing a Necessity upon the Heart to make a half Turn ; which shortens it, and makes the Sides of the *Ventricles* come near one another, and forces the Blood which is betwixt them to spring out ; likewise we may see in our Conceptions of the Motion of the Heart, that there is no Need of having Recourse to the Pulsifick Faculty, if we consider the Structure of the Part, to believe that it is capable of *Dilatation* and *Contraction* like all other Muscles.

If we examine the Make of a Water-Mill, we shall find such a Parallel Action, one Part with another, that the Water coming to strike upon the Wheel, it turns it round, and at the same Time moves all the Parts of the Mill ; for the Blood is, in respect to the Heart, the same that the Water is to the Mill, that it goes swifter or slower, according as there is more or less Water in the Stream to make it go ; so the Heart moves swifter, and beats or pulses oftner, according to the Quantity of Blood, or greater Degree of Heat that makes it flow more readily : We may moreover alledge, That this Heat is according to the Fall which is in the Stream ; and to carry on the Comparifon, we may observe, that as often as the Water is stop't from coming to the Mill, it remains Motionless ; so the Blood hindered by any Means from being conveyed to the Heart, it loses its Motion, and ceases.

It is certain then, that the Motion of the Heart is owing to the Blood, which every Day's Experience will confirm ; for if we lay a Hand upon the Region of the Heart, of one who has been running or doing any violent Action, we may perceive the Beating more frequent than before, because the Agitation

hurries

hurries on the Course of the *Blood*, and makes it enter into and flow from the Heart more swiftly; if we feel the Pulse of a Person who has fasted long, we shall find the Pulsation feeble, and a great Distance betwixt one Beating and another, because the *Blood* being then thicker, it moves slowly towards the Heart; but after the said Person has eat and drank, his Pulse will move quicker, because the Motions of the Heart encrease in Proportion to the *Blood*, there being then a greater Quantity of it, by the Addition of *Chyle*.

The Use of the *Pulse* is to propel through the *Arteries* the rarefied *Blood* from the Heart into all the Parts of the Body, in order to their Nutrition, that each Part according to its Function might take a certain Part, and convert it to its own proper Use, and return the Superfluity to the Heart again by Means of the Veins, in order to have it rarefied and spiritualized anew, whereby it might receive fresh Vigour. The Motion of the *Blood* is called *Circulation*, not because it is said to move in *Circulum*, for that is impossible, but because it begins to move by the *Arteries* from the Heart to the Extremities, and returns from thence by the Veins, and contains always the same *Route*, without ceasing, as long as the Animal lives; so likewise taking *Circulation* in this Sense, for a Liquor that returns always to the same Place from whence it first began to move, we may say the same, that Rain circulates, because, after it falls upon the Earth, it is evaporated by the Heat of the Sun, and returns again in Showers of Water, and that Water from Springs and Rivers flows incessantly towards the Sea, and is supplied back again from thence.

The Cause of this Local Motion is not in the *Blood*, since it is a Liquor like all others, that depends upon an External Cause to drive it forward; for it is the Heart that determines the Motion of the *Blood*, because it being a strong Muscle, and having vigorous Contractions, it propels the *Blood* to the extrem Parts of the Body, from whence it returns to circulate as before. The Heart is the *Machine* which makes the *Blood* circulate; it is a Pump that throws the Liquor through the whole Body, and which gives it its circular Motion; when we speak of the Cir-

culation of *Blood*, we do not suppose that is the only Liquor that flows, for the *Chyle* and *Lympha* circulate together with it; and throughout, where're there are Vessels, there are *Lymphatics*; for the *Chyle*, it circulates likewise with the *Blood*, but not at all Times like the *Lympha*, since it cannot enter but when Digestion is finish'd, and the Alimentary Fluid begins to be distributed; then if you draw *Blood* from the Arm, you will perceive a whitish Liquor floating upon it, which is nothing but *Chyle*, but if it appear serous, you may then judge that there is a great deal of *Lympha* mixed with it.

This Circulation of the *Blood*, according to Diemerbroeck, is prov'd by Three strong Reasons: First, The Quantity of *Blood* driven from the Heart into the *Arteries*, which is so great, that the Aliment taken in cannot supply a Hundredth Part of it, since this Pulsation is continued in a Man that has fasted Two or Three Days together, as well as he that has fed heartily the same Time; likewise, if the *Blood* did not return from the *Arteries* of the Heart by the *Veins*, this Matter which ought to be pulsed out would remain in the Heart, otherwise the *Arteries* would burst, or the Parts in which the *Blood* flowed would be tumefied after a strange Manner: In short, the Heart of a sound Man of a grown Age beats Three thousand Times, or more, in the Space of One Hour. If at every Pulsation it pulsed out into the *Aorta* only a Scruple of *Blood*, we might find by Computation that in every Hour there passed through the Heart at least Eight or Nine Pounds of *Blood*, and in Four Hours, Thirty or Forty, according as the Heart beat more or less; besides, if we consider the Quantity of *Blood* when we open a Vein of the Arm that flows presently out of the Orifice, and make a Computation how much at the same Time passes through an infinite Number of other Veins, in which the Course and Circulation of the *Blood* is not stop'd by the Ligature, all that *Blood* generally passes the Heart; we may easily perceive, that at each Pulsation, there is not only driven from the Heart into the Great Artery a few Drops, a Scruple or a Dram or Two, but a great deal more, perhaps half an Ounce or better.

Secondly, This *Circulation* is proved from the Situation of the *Valves* in the Veins; which is ordered or disposed, that the *Blood* flows easily and freely by them in the *Vena Cava*, and from the *Vena Cava* into the small *Veins*; at the same Time, if by a Pipe we fill the *Vena Cava* full of Wind, there will none of that enter out of the *Vena Cava* into the small *Veins*; but on the contrary, if we blow into the lesser *Veins*, it will enter into the larger, and from thence into the *Vena Cava*.

Thirdly, This is prov'd from the *Ligature* in *Blood-letting*; so that if we tie the Arm or the Leg, and beneath the *Ligature* open the *Vein*, it shall swell underneath, because the *Blood* which is pulsed forward by the *Arteries* to the extrem Parts returns by the *Veins* and mounts upwards, and when it comes to the *Ligature*, it is stop'd there, and makes the *Vein* swell below; and when the *Blood* can pass no further, it is constrain'd to flow through the Orifice; but as soon as we loose the Binding, this Flux ceases, because it is then easier for the *Blood* to rise through the Channel of the *Vein*, whose Hollow or Capacity is large or open enough for its Passage, than to flow through the Orifice which is streighter: We ought to add this Observation, That if we make the *Ligature* so tight that the *Blood* cannot pass into the Parts from the *Artery*, then it ceases to bleed any longer by the Orifice made in the *Vein*, because the *Ligature* stops the Motion of the *Blood* through the *Artery*; but if we loose the Bandage a little, so that there is Liberty for the Pulsation of the *Artery*, the *Blood* runs afresh from the Orifice: Besides; every *Ligature* or Compression of the *Veins* and *Arteries* made on Living Animals, shows plainly that the *Blood* is pulsed or driven from the *Heart* into the Parts by Means of the *Arteries*, and that it returns to the *Heart* by the *Veins*; for the *Arteries* being tied, swell above the *Ligature*; that is, towards the *Heart*, because the Passage of the *Blood* is stop'd, and the *Veins* on the contrary flag or are emptied, because the *Blood* readily flows from the Tying, and returns to the *Heart*, and on the other Hand swells below the *Ligature*.

The *Modus* of the *Circulation* is perform'd after this Manner: The *Blood* flowing

impetuously from the Left *Ventricle*, is forced by the Contraction of the *Heart* into the Great *Artery*, the more refin'd Part of the *Blood* rising upwards by the superiour Trunk of the *Aorta*, and distributes it self to the Arms by the *Axillaries*, and to the Head, by Mediation of the *Carotid* and *Cervical Arteries*; on the other Hand, the grosser Part descends by the lower Branch of the same *Artery*, and distributes it self to all the Parts below the Heart, by the *Celiac*, *Mesenterick*, *Emulgent*, *Spermatick* and *Iliack Arteries*, and by a vast number of other Branches.

The *Blood* then being conveyed and distributed as well upwards as downwards by the Two Trunks of the *Aorta*, to all the Parts of the Body, it flows to the Extremities of the small *Arteries*, and is there extravasated for the Nutrition of all the Parts, and all that is extravasated from the *Blood* is not spent entirely upon the Nutrition, what remains enters into the Orifices or Mouths of the *Capillary Veins* by the Impulsion of new *Blood*, that flowing continually from the lesser *Arteries*, obliges that which passes before to return by the minuter *Veins* into the larger: The *Blood* which is sent into the Head makes its Return to the *Heart* by the *Jugulars*; and that of the Arms, by the *Axillaries* into the *Subclavians*, and from thence into the upper Trunk of the *Vena Cava*. The same is likewise done with *Blood* sent into the inferiour Parts, it returns to the *Heart* by the *Iliacks*, and all the *Veins* of the Lower *Venter*, which disimbugue themselves in the descending and ascending Trunk of the *Vena Cava*; and likewise all the *Blood*, as well in the upper as lower Parts, meet and unite in the *Vena Cava*, and proceed to empty themselves into the Right *Auricle* of the *Heart*, and from thence into the Right *Ventricle*, from whence it is pulsed out as often by the Contraction of the *Heart* that obliges it to enter into the *Pulmonary Artery*, not being able to return into the *Vena Cava*, by reason of the Formation of the *Tripuside Valves*.

The *Artery* of the *Lungs* having received the *Blood*, carries it to the *Lungs*, and there distributes it through the whole Substance of them, from whence it passes afterwards, with the more subtle Part of the Air, brought

brought thither by the Extremities from the *Trachea* into the Branches of the Pulmonary Vein, which conducts it to the Left *Auricle* of the *Heart*, and from thence into the *Ventricle* on the same Side. And as the *Blood* cannot return back again by the Way it enters, by reason of the Situation of the *Valves* in that Vein; it flows impetuously from the *Ventricle* by the Contraction of the *Heart*, and enters into the great *Artery*, which distributes it thence to all the Parts of the Body, from whence it is again brought back to its Spring-Head, through the little Veins into the larger, and from those into the superior and inferior Trunk of the *Vena Cava*, to renew its perpetual Circulation, which ceases not but with the Life of the Animal, or rather, to speak more properly, the Life of the Animal ceases, if this Motion discontinues but for a Time; and the *Blood* flows in this Manner not only to renew the Mass, which without this continual Agitation would corrupt and decay, but also to purify and subtilize it from its Excrements; and, in a Word, to render it more fit for the Nutrition of all the Parts of the Body.

But as this Mass wafts considerably by the Loss of Spirits, which are employ'd upon the Nourishment of the Parts, or that continually perspire through the Pores of the Skin, which drains it off insensibly, if it was not daily supplied by the Chyle with fresh Blood and Spirits fit to recruit it. The *Heart*, says a Modern Author, is in the middle of the Body, like a Wheel or Water-Engine in the middle of a Garden, that is placed there to convey Water to all Parts, by an infinite Number of little Streams that are appointed to Water every Quarter: The Canals that brings the Water through the Gardens, are like the Veins that carry the *Blood* to the *Heart*, but the *Arteries* are just like the Conduits which supply all the Garden with Water, for these Conduits do not contribute as the efficient Cause to the Motion of this Water, whereas the *Arteries* give a great Assistance to that of the *Blood*, since their carnosus and circular Fibres are like moving Rings; which, by their Contraction, drive forward the *Blood* which they enclose. The Water which stays in the Quarters, or several Parts of the Gar-

den for the Nutrition of the Plants, is like the *Blood* which remains upon the Parts for their Nourishment; and the Water that is brought again to the Cistern, and not employ'd in watering the Ground, is like the *Blood*, which not being bestowed upon the Nutrition of the Parts, returns to the *Heart* by the *Veins*.

The *Heart*, says Mr. *Duncan*, is like the Sea of this little World; the Agitations of the *Blood* are as the Flux and Reflux; the Passions like Storms or Tempests; the *Arteries*, which carry the *Blood* from the *Heart* to other Parts, are like the Subterranean Channels, or the Waters that come from the Sea; and the *Veins* which bring back the *Blood* to the *Heart*, are in short, like the Rivers and Rivulets, which convey it to the Sea again; so that the Little World, as well as the Great, is divided into Sea and Land: The Fluids are like the Waters, and the Solids dry Land; or, we may say on the other Hand, that the Earth is like a great Animal, whereof the Sea is like the *Heart*; the Subterranean Channels which receive the Water from the Sea, represent the *Arteries*; and the Rivers which flow back, like the *Veins*; the little Pipes which carry the clear Water from the Fountains, are like the Lymphaticks of a great Animal; in short, the Motion of the Waters from the Sea to the Land, and those from the Land to the Sea again, is a very expressive Image or Resemblance of the Circulation of the *Blood*.

Some will pretend to affirm, That it is not difficult to explain how the *Blood* passes from the *Arteries* into the *Veins*, since there is an *Anastomoses* betwixt them; but these Communications of the *Arteries* with Veins are not consonant to Reason, and they only assume to know what they cannot discover; at the same Time they suppose with the Ancients, that it is impossible for the *Blood*, to extravasate the *Arteries*, and enter into the *Veins*, but that it continues its Motion by the largest, straight and open Ways, and never enters into the narrower crooked Passages; so that, according to this *Hypothesis*, there can be no Separations or Filtrations in the Glands, because the *Blood* passes directly from the *Arteries* into the *Veins*. We shall strengthen our Arguments against the

Anastomoses of the *Arteries* with the *Veins* by Two undeniable Experiments: The First is, If we make an Inspection of warm Water into the *Artery* of the Arm upon a dead Body, and afterwards make a Ligature on the Vein that accompanies it, then prick the Vein, and you will find that the Water will not flow, though all the Arm and Hand were fill'd before. In the next Place, If you Syringe an *Artery* with red Wax, or what you will, and make also an Injection of another Colour into that Vein which answers to the *Artery*, you will have the Pleasure to see all the Capillary Branches and the Substance of the Part penetrated with the Wax; but you cannot find any where the Two Injections mix'd together, and the Wax confused or jumbled together in passing by a common Canal from the *Artery* to the Vein: These Two Experiments show plainly, that there is no *Anastomoses* of the *Arteries* with the *Veins*.

The *Blood* of the *Arteries* which passes into the *Lungs* is so exalted and brought to Perfection, that that which is carried to the Brain serves for the making of Animal Juice; that which goes into the *Parotide* and *Maxillary Glands*, for the Separation of *Saliva* or Spittle; into the Glands of the *Oesophagus* or *Stomach*, for an acid Liquor; into the *Pancreas*, for Pancreatick Juice; into the *Liver*, for Bile or Gall; into the *Reins*, for *Urine*; into the *Testicles*, for *Semen*; and into the *Breasts*, for *Milk*; in short, it gives to all the Parts Moisture to allay the Heat, and is the Cause of that Vital Motion we observe: From hence it is that the Parts deprived of *Blood* perish, and dry up like Plants that are deprived of their Sap; as for the *Blood* in the *Veins*, it is of this Advantage, that it preserves Heat to the Parts through which it passes. For the rest, it is easy to see that the Circulation maintains the Fluidy, and without that Motion it could not be fit for Nutrition, but would turn to a grumous Serum.

The *Blood*, according to *Diemerbroeck*, is a red Liquor made from *Chyle* in the *Heart* and the *Lungs*, for the Support of the whole Body; it is composed of Two different Juices, and of *Serum*, which is of a middle Nature betwixt both. Of the Juices, the one is *Sulphureous*, and the other *Saline*; the

Sulphureous is something greasy, oily and viscous; from whence it comes, that in Dissolution it will not so well mix and unite together, without some Loss and making a Noise, except there intervene some *Mercury*, which is so familiar to the Nature of one and the other, that both their Powers are exactly mix'd with it, and in it; for this *Mercury* is the same *Serum*, in which, by the Means of Coction or Boiling, the more aqueous Particles of the Juices are dissolv'd and mix'd together; likewise the *Serum* is composed not only of the aqueous or watry Part of the Aliment, but also of some *Sulphureous* and *Saline* Parts, blended in Fusion; so it partakes of a Temperament betwixt both, in such a manner, that the Mixture and Union of the Two Juices is made of a good Texture therefrom; and it is for this Reason that it be well concocted and mix'd with a due Quantity of other Juices; for if it is in too small a Quantity, or that it want entirely its active Principles, to wit, the *Saline* and *Sulphureous* Juices united too strictly, they act with Violence and oppose one another, and by this Struggle or Opposition they break atunder and consume by Way of Colligation; whence it comes that the Body waists and grows lean, being deprived of its Aliment, or that the Aliment corrupts, becomes Morbifick, and in the End decays: But if on the contrary the *Serum* is too watry, crude, and in too great Plenty, then the same active Principles separate themselves, and are too remote from one another, and their Union becomes too lax, so that they do not support one another, or act sufficiently; whence it comes that the *Blood* is too humid, and is subject to Corruption, and all the Body being nourished from such *Blood*, is render'd weak and languishing.

In this Mixture of the *Sulphureous* and *Saline* Juice in the *Serum*, the *Sulphureous* Juice gives it its Aptness of Action, but the *Saline* Juice is that which affords the chief Consistence; for being of a more fix'd Nature, it prevents the *Sulphureous* Juice that is mix'd with it, and clings to it by its Particles from dissolving so easily: It likewise retards Dissolution of the Mass of *Blood*, and resists very much Rottiness, Corruption and Inflammation; and as it has a Disposition

position or Tendency to be fix'd, it happens from thence that the *Blood* that is spread over the Substance of the Parts is coagulated, clings to, and becomes assimilated to it.

The *Blood*, according to *Willis*, has Five Principles, *viz.* Spirit, Sulphur, volatile Salt, Earth, and Water: The Spirit retains the *Blood* in a just and natural Temperament that agitates it, being chiefly assisted by the Heat of the *Heart*, and in the Action, if it becomes Victorious, it drives away all Exotick Bodies that mix themselves with the *Blood*, and makes it truly Homogeneous; they call *Sulphur*, the oily Parts of the *Blood*, that are confus'd amongst the rest, but smooother, and are the Cause of the Grease that we see throughout the Body, in Inflammations and excessive Heats, that happen in Fevers; and in short, of the very Redness of the *Blood*, since they are Sulphureous Bodies that give this Colour to their Dissolvants, call'd in Chymistry, *Menstruums*. The *Volatile Salt* is the Third Principle of the *Blood*, which hinders Crudity and Corruption, except when the Salt is too strong, as in the *Scurvy* and *Quartan Ague*, or else too sharp, and more apt for Coagulation, is in the *Gout*, *Leprosy*, and several *Chronick* or obstinate Diseases. In the *Blood* we find twice as much of Water as other Principles, which gives it its Fluidity and Coolness.

There is in the *Blood*, according to Modern Authors, fatty Particles, that compose or make up the Balls or Globules of the red Part, that turn upon their own Centre a thick *Lympha*, that contains in it a great deal of Jelly, proper for the Nutrition of the Parts, and the Aqueous and Saline Part of the said *Lympha*, that flows by *Urine*.

The *Whitish Jelly* that floats upon Humane *Blood*, when drawn from the *Vein*, is not from the *Ptuite*, as is not yet well assimilated to it; from whence comes the Observations made on *Blood* that is white as Milk, and taken from healthful Men, which is nothing but *Chyle*, that has been ill changed. The same *Fibres* of *Blood* that appear red, are really white, and come from *Chyle*.

Sanguification, according to late Authors, is nothing but a Purification of the *Chyle*, not only by being freed and disengaged from

several Particles in the Glands, but likewise by passing through the *Lungs*; where the *Air* modifies anew. In short, they explain *Sanguification* after this Manner: The *Chyle*, in passing through the Glands, is filtered, or rather it is changed into several Substances; the one is gluey like that of Jelly, the other is liquid like Water; there is besides another which is Fat and *Sulphureous*, but it must pass several Circulations before the *Chyle* can be freed from this fat or greasy Part; for it remains a long Time in the Vessels under first Form. At first, when the Saline and Sulphureous Particles come to pass by the Lungs, the Elastic Vertue of the *Air* turns them round; and after having traversed several Times the *Vessicles* of the *Lungs*, they are all changed into little firm Bladders, to preserve their Figure round, and to turn upon their Centre; in short, it is the Mass or Heap of all these little Balls, that gives this fine Scarlet Colour to the *Blood*.

What would persuade us that the Sulphureous Part acquires that Modification in the *Lungs* is, that the *Blood* that flows from thence is always florid and full of Froth, but the most convincing Proof that the Redness of the *Blood* proceeds from those little Globules, is when you see it whirl round in a Crystalline Liquor, by observing the *Blood* while it is yet hot with a Microscope: This Motion continues as long as the *Blood* remains fluid, but as soon as it is coagulated, the Globules cease to turn, they appear close together and lose their round Figure, which is that that makes the *Blood* look black: It is also the same Cause that makes the *Blood* in the *Veins* always less red than that in the *Arteries*, because that the Cavity of these little Globules, not being so much extended or stretch'd as they were in the *Lungs*, by the Spring of the *Air*; which, if it is weak, they shrink up, but as soon as ever the *Blood* passes again through the *Lungs*, the Disorder and Confusion they were in before is recovered, and by the Circular Motion the Spring of the *Air* communicates to them, they are swell'd or blown up again, which makes the *Blood* appear so red from the Rarefaction that the Light gives by the Modification of the Rays shining athwart them.

The *Redness* and *Liquidness* of the *Blood* then depends on these little Globules and their Motion, for we cannot well be persuaded that these little Globules are of that Colour, though they appear red, if we observe them apart, for then they look as transparent as Crystal, they are not then red of themselves when single; but when several of them are together, the Light which runs cross breaks it self under certain Angles, which makes it appear red, after the same Manner as Water forms the Rainbow when the Light falls athwart it.

The Red Colour of the *Blood* depends on the Action of the *Air* that touches the *Blood*, and modifies the *Superficies*, after the same Manner as we have shown that the Light makes it appear red; likewise the *Blood* of the *Veins*, which is black, is not so from the *Air*, which forms upon it a Pellicle or Skin of a Scarlet Colour. If we stir *Blood* with a Stick, this black Colour will turn to a fine Red, only by the Communication of the *Air*: The same Thing happens to the *Blood* of the Arteries; for, when it is coagulated, there is nothing but the *Superficies* of it, which the *Air* affects that is red, the rest is always blackish.

During the Time that all the Humours run through the Body, and that the fatter and more sulphureous Particles change themselves into little Balls, the Remainder of the *Chyle*, by the Force of Circulation, dissolves and melts them, and the *Air* which it receives in passing into the Lungs changes it into a Substance, which has no more Motion or Activity than those Particles which serve to make the *Blood* red. This Liquor is of such Importance, that without it we can have no Subsistence.

We may enquire from whence it comes, that in great fat People, in whom there is abundance of Sulphureous oily Particles of the *Blood*, that are hotter than others, yet notwithstanding have less Agility of the whole Body, and less Activity of the Animal Spirits; but on the contrary, these Persons are very idle or lazy, more subject to Sleep, and much addicted to the *Apoplexy*, *Carus*, *Asthma*, and other the like Affections, than those who are lean. *Diemerbroeck* answers, that this proceeds from hence, that in gross Bodies the oily Sulphureous Particles exceed

very much in Quantity the Saline, which are embarrass'd and blunted by the oleaginous Fat of the other, so that they are not subject to be inflamed, attenuated, or sufficiently spiritualiz'd; which makes it, that they are less disposed and less proper to generate so large a Quantity of Animal Spirits, which are the principal Causes of the Agility and Activeness of the whole Body; and likewise, not procuring a sufficient Quantity the Animal Actions become lax and slothful, and are succeeded by sleepy Indispositions; add to this, that the Heat of the *Sulphureous* Parts is in it self as it were benum'd and is not much animated except by the Assistance of the Acrid Saline Parts; it raises no Effervescence in the *Blood*, but by a Motion of the Particles amongst themselves. But if the fat Sulphureous Particles predominate too strong over the Saline, that they obstruct, blunt and weaken the Points, the Particles so affected cannot raise themselves to a Point, or act in Fermentation. They may object perhaps here, that in Feverish Indispositions the Sulphureous Heat lies above; yet notwithstanding the Animal Actions are not always loose and benum'd. The same Author answers, That this proceeds from hence, that in Feverish Affections, the Sulphureous oily Parts of the *Blood* do not exceed the Saline, and blunt them by their Quantity or Oiliness, but that they increase their Acrimony, and act more powerfully, causing an Effervescence, either too violent, irregular, or feverish.

The *Blood*, says the same Author, forms to it self, by proper Fermentations and Concoctions in the *Viscera*, Two Sorts of Spirits, to wit, the Sulphureous, and the Saline; the one sweet, the other acrid, both of them very fine and subtle, the Sulphureous notwithstanding being more volatile than the Saline. *Chymistry* shows us the like Spirits both from one and the other; such are the Sulphureous Spirits which are observed in the Chymical Oils drawn from Vegetables, and the Saline Spirits, which are likewise drawn from Salts and Saline Things: That *Sulphureous Spirits* are more subtle and volatile than the *Saline*, is evident in the Distillation of Vegetables; for these separate first of all, and rise easily in the *Alembick*, if they

they are not hindered and tied down by the Saline.

These Two Spirits mix together in the Mass of *Blood*, from whence they are raised by Fermentations; and being from Time to Time carried with it into the *Heart*, and many Times attenuated and dilated together, they are united so exactly, that at last they become entirely one Spirit, which we call *Vital*. For the *Vital Spirit* is the more subtle and efficacious Part of the *Blood*, composed of *Sulphureous* and *Saline Particles*, dilated and united together by the Fermentation which is made in the *Heart*: It is said to be the most subtle and efficacious Part of the *Blood*; that is to say, such as is drawn from the *Sulphureous* and *Saline Particles*, for that is not fit to be called Spirit whose Substance is only a subtle Vapour, such as that that is raised from the ferrous Part of the *Blood*, which has no Power to promote Action; but being mix'd too plentifully, it breaks and lessens the Action and Force of the Spirits, and opposes their Activity.

When the *Blood* immediately sinks in the *Heart*, the Connexion of the Parts throughout the Liquor is dissolv'd; by this Dissolution the Spirituous Particles unite themselves, strictly together, and being thus united, they endeavour to separate themselves and extend on all Sides; but being confin'd within the Vessels, they are jumbled together with the rest of the Liquor, and likewise thrusting themselves forwards, and springing forth with Violence into the open Mouths of the *Arteries*, they expand or spread jointly with the *Blood* throughout all the Parts of the Body, and convey their Heat.

The *Vital Spirit*, in the Efforts it constantly makes to fly away, because of its extrem Volatility, agitates continually the other grosser Particles of the *Blood* in which it is confined, and excites it self different Ways; but as its Passage is obstructed by the different Shocks it suffers in its Repercussions, it disunites the Particles, removes one from another, alters, subtilizes and makes a continual Motion of Fermentation; from which, and likewise from the Agitation of the subtle Matter, proceeds the Heat of the *Blood*; which, when the Agitation is moderate, is likewise so, and when

otherwise, is accordingly affected, being as the various Alterations happen, either hotter or colder.

By this Motion also, that is raised by the Spirit, the *Blood* is not only preserv'd in its Heat and Texture, that is to say, a perfect Mixture, but it is likewise render'd fluid and proper for Nutrition: And if on the contrary it is destitute, or wants this Motion and Spirit, it thickens, coagulates, decays or corrupts, and becomes at last entirely useless; otherwise this Spirit, by its Motion or Agitation, attenuates the *Blood*, so much, that it makes it capable of insinuating and passing jointly with it, into all the straight and narrow Passages of the Body, all which it excites to perform the Actions and Functions which they are design'd for; likewise the same Spirit, which by its continual Agitation and Heat, dissipates without ceasing, and destroys the more fluid Particles of the Parts, perpetually supplies them with others in their Room.

Willis and *Rohault* say, That they judge it very like to the natural Heat which is in us, attributed originally to the *Blood*, and they conceive it to be like that which proceeds from the Mixture of Two Liquors; for Example, from the Mixture of Oil of Tartar with Oil of Vitriol. For when the Parts of the *Blood*, which being rarefied in the Cavities of the *Heart*, are flowing to enter into the Venous *Artery*, and in the *Aorta*; the little *Blood* that remains then in the Cavities, and that which falls anew from the *Auricles* of the *Heart*, possesses the Place of the Two Liquors, and that which comes from the *Left* of the other, to make it dilate: From hence it is manifest, that the Heat which communicates it self to all the Parts of the Body, by the Means of *Blood* which comes continually from the *Heart* by the *Arteries*.

To know how the *Vital Spirits* form themselves, says Mr. *De la Chambre*, we are to suppose that the *Blood* that is in the *Vena Cava* enters into the Right *Ventricle* of the *Heart*, where it is warm'd by the Heat and Motion of that Part which is the hottest of all the Body, and after that flows boiling hot, and smoking into the *Lungs*, where it meets with the *Air* that is brought by Inspiration; which, by its Coolness and Thick-

ness, the Fumes that exhale from the Parts, and which are no other than the very Spirits, whereof they are full, and that by less Heat separate and exhale, after the same Manner as is done in Distillations of *Aqua Vita*, where cold Water is placed round the Receiver to condense the *Vapour* into a Body; for which Reason the *Vein* that carries the *Blood* smoking into the *Lungs*, is as thick as an *Artery*, in order to hinder the Diffipation that might be made before it be cool'd; on the contrary, the *Artery* which receives the *Blood* after it has been refrigerated, is as thin as a *Vein*: And perhaps this is the Reason why this *Artery* has but Two *Valves*, instead of Three, which all the other Vessels have that enter the *Heart*; for as the *Valves* are made for no other Use than to hinder the Impetuosity of the *Blood* from entering the *Heart*, and there being not so much Want of *Valves* in the *Arteria Venosa*, there are but Two, because the *Blood* is cooled and temper'd by the Air, which is mix'd with it in the *Blood*.

After the *Blood* which flows from the Right *Ventricle* has traversed the *Lungs*, it discharges it self into the Left, where it is mov'd and agitated afresh, and where the more subtile Parts refund themselves after such a Manner, that they require all the Dispositions necessary to make the Vital Spirits. As these Things preserve themselves by such Things as are natural to them, and Motion being natural to the Spirits that are of a fiery Nature, they must be kept perpetually in Motion like that Body, for we cannot stop the Motion of Fire with extinguishing it; and every Thing that hinders the Spirits from Motion, as *Narcoticks* and *Plenitude*, destroys the Animal. It is then from the Providence of Nature, the Inventor and Author of every Artifice, that the Vital Spirits are continually agitated, in order to preserve and continue what is most proper and natural for them: And we cannot find any Thing more commodious than the Motion of the Heart and the *Arteries*; which excite, quicken and revive, every Moment the Spirits that are mix'd with the *Blood*; for as this Humour is gross and heavy, there is Danger it would be stifled by its own Weight, if this wonderful Spring which puts the *Arterial Blood* in a continual

Motion, did not prevent that Mischief; and for this Reason the *Arteries* attend the great *Veins*, that their Action and Weight may raise the Spirits that are mix'd with the *Blood*.

When the *Blood*, says *Diemerbroeck*, is made up of a *Sulphureous* Principle, and a *Saline* one, mix'd together in due Proportion, it is very good and naturally well temper'd; but if the Strength of one of these Principles exceed that of the other, then the *Blood* becomes too cold, or too hot, and we see according to their Excess such or such a Temperament prevail; for 'tis said too cold, not but the Quality which we call Cold proceeds from Salt, or Spirit of Salt, as its proper Subject; but this is so, that if the Salt predominate, the Sulphureous Spirit is not much blunted and coagulated; from whence it comes that the Motion and Agitation of the small Particles amongst themselves is less, whence it must necessarily follow, that they less excite the actual Heat. Add to this, that the Salt or Spirit is not called cold, that because being thrown into the Fire it only crackles, and does not flame as if made of *Sulphur* or Spirit of *Sulphur*.

Now the *Blood* composed of these Principles creates a less or greater Quantity of Spirits; for if the *Blood* that with the *Chyle* ought to be rarefied in the *Heart*, be well concocted in the other *Viscera*, and well disposed to be fermented, or rather to be exalted to a perfect Maturity, than if a just and equal Effervescence, or Dilatation in the *Heart*, which raises a moderate Heat, and produces a convenient Quantity of Spirits; but if the *Blood* for some Cause or other is not sufficiently or fitly prepar'd, and remains crude, its Effervescence and Dilatation in the Heart are less, and it cannot raise the Spirits; from whence follows an intemperate Coldness of the whole Body, which if on the contrary, it be too much concocted, and the Particles whether *Saline* or *Sulphureous* being mix'd together, and too much attenuated when it is rarefied exceedingly in the Heart, and creates Spirits too hot and acrid; from whence proceeds a too hot Intemperance or Excess throughout the whole Body, a Corruption of Humours, Inflammations, Fevers especially, if the Sulphureous Spirits prevail upon the Saline.

The *Fermentation* of the Mass of *Blood*, says *Etmuller*, is disturb'd several Ways, sometimes by Excess, and then the Effervescence is dangerous, which is known by the *Pulse* being large and quick, and attended with an inordinate Heat throughout the whole Body, and is the usual Original or Source of all acute Diseases. Sometimes it is disturb'd or injur'd by a Defect or Want of Spirits, and then the *Pulse* is small, slow and feeble, the Body is as it were lukewarm, and all the Functions are languishing, as it appears especially in Cronick Diseases. In short, the Fermentation of the *Blood* is injured several other Ways; from whence it comes that the Inequality and Diversity of the *Pulse*, and other Parts of the Body, which is sometimes hot, and sometimes cold, sometimes red, and sometimes pale, especially the Face.

The efficient Cause of all the vitiated Fermentations is the Vital Spirit, as the First Author of Intestine Motion, but the Material Cause is the Fault of the Contexture, Proportion and Harmony, of the small Saline and Sulphureous Particles of the *Blood*, which proceed sometimes from the Non-naturals, especially the Aliment or Food; sometimes from an Hereditary Vice, by reason some old People beget weak and diseas'd Children; sometimes from some foreign or contagious Ferment received in with the Air by Respiration, or otherwise.

When the *Saline* Particles of the *Blood* are not well temper'd by the oily, they become more acrid, contest together with greater Violence, and make a very strong Effervescence; as it happens in Burning Fevers, Plurisy, Quinsy, Measles and Small-Pox. And when the same Particles are too temperate, and as it were suppress'd or overpowered by *Crude Chyle*, they volatilise with a vitiated Acidity, then the Fermentation is too strong, as may be seen in *Cachexia* of Men and Women, the *Leucophlegmatia* and *Anasarca*.

If it happen that the *Acid* and the *Alkali* are too much remov'd from the Natural Constitution, that the one acts too much upon the other, the Fermentation is almost entirely lost; for if the Acid prevail, the Mass of *Blood* is coagulated, and the Body is affected with *Syncope*, and sometimes

Death it self; and if *Urinous*, it is easily dissolvable, as the Infusion of Liquors demonstrate: But if these Salts are destroyed any other Way in mixing together, or with other Particles, so that they gain a strange Savour, then Hysterick Affections, Scurvy, Hypochondriack Melancholy, Jaundice, the Pox, and several other grievous Distempers ensue.

As the subtile Particles of Wine stop'd close in a Vessel, as *Willis* says, agitate and mix perpetually one with the other, till they separate from their Substance all the Heterogeneous Corpuscles; so that their Action is sometimes so strong as to make Way through the hardest Bodies: The Vital Spirits likewise confin'd in the Animal, makes such a Motion and Circulation as never ceases, that stirs up all the Mass of Humours, which it drives away through the small or larger Apertures, according as the same Humours are foreign or disagreeable to its Substance; and if it is obstructed, it sometimes breaks the Vessel, or only makes a Flame or violent Burning, and make the Animal perceive those Effects we call a *Fever*.

As Wine and most other Liquors have their Crudities and their Beginnings, their Maturity and Perfection, their Badness and Goodness, the *Blood* in like Manner has the same, according as the Spirits are hem'd in by the *Chyle*; as they are divested, as they evaporate and are exhausted from the Animal. The Crudity of the *Blood* appears in found or healthful Bodies, when after eating they perceive a Weight, Oppression and Indisposition to Action. It appears besides in Dropsical Patients, in those who have pale Complexions, that are subject to Intermitting Fevers or Agues, and generally in those who have their *Blood* full of Water, Salt, Sourness and Indigestion. The Maturity of the *Blood* appears some Hours after Victuals, when by the changing of the Food into *Blood* and Spirits, we are sensible or feel the Force and Vigour of it; the End appears in the length of Fasting and Labour, or otherwise from the Digestion or Concoction, that renders the *Blood* either Bilious or *Melancholy*.

Milk is compounded or made up of Three Sorts of Substances; which are, *Cream* or
But-

Butter, Cheese and Whey, otherwise call'd, *Serum*. The *Whey* will coagulate or curdle again, because it contains several Parts of *Butter and Cheese*. It is also the same Thing of *Blood*, if it is not entirely broke from its natural Constitution; in short, if we take it and set it to cool, we may see at the Top the purest and most florid Part, which we may call the Cream, or the Flower of the *Blood*; there is besides a red Substance, composed of Filaments, Fibres and small Podies, reciprocally join'd together; this Part of the *Blood* answers to *Cheese*, these Serofities separate from Two other Sorts of Bodies more gross that swim upon them, and like *Whey* will coagulate again; if we set this Liquor to the Fire, it gains a Colour and Thickness like the White of an Egg; if we mix with it any sharp Liquor, it thickens and grows white: Some for this Reason believe, that that Liquid and serous Part of the *Blood* we now speak of, is that which nourishes all the Body, and that the other Substances which compose the Mass of *Blood* are only the Vehicle of the Heat and Spirits. Nevertheless, *Willis* believes, that the *Blood* like Water nourishes the Nervous Parts, and those that are commonly called *Spermatick*, as it is thought that the Fibrous *Blood* nourishes the *Parenchyma* and the Muscles: *Erasistratus* and the *Greeks* call'd that the *Parenchyma*, which they fancied were made from the immediate Infusion of the *Blood*, as the Liver and Lungs.

The *Blood* appears faulty or defective; sometimes in its white, green or yellow Colour, and sometimes in its Consistence and Fluidity; its Colour is white, like foddren Flesh, and a kind of Decay: It is like that of a *Curon*, by the Mixture of *Salt* and *Sulphur* or *Gall*, or some other Liquor, like that of the Infusion of *Sena*; in short, it is black when the *Blood* is dry and burnt, or otherwise earthy. Its Consistence is sometimes without Water, as in *Hæticks*; sometimes with too much Water, as in *Dropsies*; sometimes it is like *Broth*; sometimes, in short, the *Blood* is coagulated, not only after it is drawn from the *Vein*, but while it is confin'd in the Vessel; and from hence it is the Cause of abundance of Disorders, as *Pleurisy*; for Example, *Quinsey*,

Peripneumonia, *Dysentery*, both Sort of *Foxes*, *Plague*, and all malignant Distempers.

It is certain that the Agility and Readiness of the Spirits, the Volatility of the Salts affecting the *Blood* in a perpetual and natural Agitation, attenuate and mix all that enters into its Substance; and in short, produces the same Effects, that every Body may observe in *Wine*. There is this Difference betwixt *Wine* and *Blood*, that the *Blood* suffers or undergoes, without Discontinuation or Age, a Renovation of its Parts, a Reception and Expulsion of divers Bodies, and that it is never the same. On the contrary, that the Times of its Crudeness, of its Concoction, and its Defect in respect to the different Bodies which are contain'd in it, are undoubtedly the same. These Things cannot be done without *Leven*, that depend either on Art or Nature; the Digestive or Aperitive Remedies, like those taken from Steel, are artificial; the sharp Liquid contain'd in the Stomach, that which is in the Spleen, the Vigour of the genital Parts; in short, the Heat of the *Heart*, in which the *Blood* enters like a gentle Spring, but flowing like an impetuous Torrent, forms a Ferment or Natural *Leven*. The first and principal Effect of this Fermentation, is the Conservation of the *Blood*, and the Separation of the Excrements.

The preternatural and feverish Motions of the *Blood* proceed from the *Blood* being ill disposed or distributed in the Heart and Vessels, like Water over the Fire, or rather like some Liquor full of burning *Sulphur*, for then it casts off a Scum and Fume with a Force and Strength able to destroy the Animal; it raises the *Pulse*, spreads a burning Heat on every Side, and drives with Violence all before it. The Cause of this is Threelfold, the one is External, the other Internal, and the Third partakes of both: The two first are common to *Wine* and *Blood*, the last is common to *Blood* and *Milk*; when, as the Chymists say, they precipitate, that is to say, when the Parts separate. When this Separation happens to the *Blood*, and that the more subtile Part grows thick and coagulates, as in the *Pleurisy* and *Veneral Disease*, there will arise strange Accidents, and amongst them a very dangerous Fever.

The

The End of the Nutrition is to maintain and preserve Life, and to be serviceable for the Growth and Increase of the Parts; for the *Blood* being a Fluid that moves without ceasing, it dissipates every Moment some Part or other, and it is necessary it should recruit again to repair and restore the lost Particles. There are two Sorts of Nutrition maintain'd: The first is made presently, when the Parts have not acquired their Covering or Cloathing; and the other happens, when all the Parts have attain'd their just Size and Proportion. When we are Infants, all our Parts are soft and tender, and seem to be nothing else but a Bundle of Pipes and Bladders that are extended to receive the Nutrition, which not only stretches and blows up or swells their Pores, as Air or Water fill a Sponge, but likewise by metamorphosing it self into the Substance of the Parts by the Dispositions it makes in such and such a Manner; and when all the Parts of the Body are arrived to a certain Bulk, the nutritious Juice which water'd them, cannot make any further Progress by changing it self into their Substance, but maintains them in the same State of Bigness in filling all their Cells or Cavities, as Water does those of a Sponge. This is what may be call'd a Pastard or Spurious Nutrition to distinguish it from the other.

It is not the red Part of the *Blood* which serves for the Nourishment of the Parts; but, according to *Synalve*, it is that sweet and glutinous *Serum* that thickens when put upon the Fire. This nutritious Juice is not a heterogeneous Liquor, that contains in it several Particles of different Size and Figure, and those proper for the Composition of Bones, Muscles and Membranes; but this nutritious Jelly is a homogeneous Liquor, which moulds or forms it self according to the Order and Disposition required in the Parts: And it is not difficult to conceive, how a Liquor, as this Jelly, may supply the Parts that are so different in Structure and Use, since it is capable of being converted into what Figure or Substance soever is required, as we may see likewise in Rain, which is nothing but Water, yet nourishes all Sorts of Plants, Roots, Leaves, Fruits and Flowers. This Water, which is tast-

less, is bitter in Wormwood, acrid in Mustard, sweet in Liquorice, solid in the Wood, and pliant in the Leaf and Flower: In short, it is astringent and purgative in Rhubarb, and in other Plants has different Vertues. And would any one believe that all these various Parts were contain'd in Water? No, they would think it impossible, and rather be perswaded, that all the Vertues of Plants, and all the Diversity of their Parts, proceeded from the different Modifications of the Sap.

The efficient Cause of Nutrition depends on the Spirits; for we may see that the Parts grow lean when there are Obstructions that hinder their Passage, because the Vesicles not being sufficiently extended, there is not Passage for the Spirits thro' the narrow Ducts they use to perviate, the Truth of which we may see every Day in Paralytick Parts, that are lean and cold, because the Obstructions hinder the Course of the Spirits.

The *Lympha*, according to *Etmuller*, is a Liquor naturally watry, subtile, spirituous, and a little acid, abounding with a moderate Acridness. The Matter which composes it, is nothing but the *Serum* ting'd with the nutritious Juice of the spermatick or nervous Parts, which it collects in the Glands, and is brought from thence into the *Blood* by the Lymphatick Vessels. This *Serum* receives in the conglobate Glands a subtile, volatile, acid Liquor, or a saline Acid, which the *Arterial Blood* leaves there.

The *Lympha* is carried to certain Cavities of the Body for some particular Services, or to the Mass of Blood near the right *Axillary Vein* for general Use. We know not yet what the Use of the *Lympha* is, that it mixes it self with the *Blood* in the *Axillary Vein*, as it throws it self into the *Blood* near the *Heart*, which conveys it to all the Body, and that it enters presently into the right *Ventricle*, then into the Lungs and the left *Ventricle*. Some presume from hence, that it serves to repair the vital Vigour of the *Blood*: Others say, that it is to dilute the *Blood*, to make it more fluid, apter to ferment, and not so easy or ready to coagulate, because that that which descends from the Head is depriv'd of Spirits, and that which ascends from the lower Parts has a great deal of *Serum* in it.

Some

Some Moderns assure us, as we have said before, that the *Lympha* nourishes the Parts, and they conjecture that it is perform'd thus: They say, that all the round or globular Parts of the *Blood* that are in a very rapid Motion, unite to all those that are glutinous in it; this gluey Part melts or dissolves by rubbing against them all the Balls or globular Parts, by which Means they become more liquid, and in a better Condition for penetrating the vesicular Texture of the Parts, where they are again driven forward *de novo* by the Motion of the Balls, which press *at tergo* or behind, and which are of Use to make them enter further.

They add, that the *Lympha* moves as the *Blood*, from the *Heart* to the Extremities, and from thence to the *Heart* again; that first it is the *Blood* that spreads by the *Arteries*, and that afterwards it returns by the *Veins* and the *Lymphaticks*, which are small transparent Ducts, and so fine or thin, that if you touch them roughly with your Finger, they presently break and disappear, because the *Lympha* all runs out. They will have it besides, that these Ducts have two Membranes, by which the *Lympha* is carried from the Center to the Circumference of the Body; but they cannot yet discover these two Membranes, nor the Space they leave betwixt them to permit or allow the *Lympha* to flow from the Center to the Extremities. The *Lympha* does not flow to the Extremities at all, but on the contrary it comes from thence, as we may be satisfied by the Ligature and Injections. In short, they say, that its Use is

entirely necessary in the Animal, that this is what supplies us with *Saliva*, the Stomach with a Dissolvent, and that it is this that makes the *Chyle* more fluid and fit for Motion; and in a Word, that it makes up the greatest Part of the *Blood*; for if we take away the *Lympha*, the Mass of *Blood* is reduced to a very small Thing: That it nourishes the Parts, and revives by its gelatinous Fat, and that after several Circulations, it leaves the sulphureous and saline Particles in the *Blood*, and jellies in the little Pores of the Vesicles of the Parts, that afterwards it it becomes clear and transparent as before, without having lost any Thing of its dissolving Virtue, so that it is in a Condition of dissolving of fresh Aliment.

The Separation of the *Lympha*, or its Infusion from the Glands in the Parts, is vitiated in its Production, when it is too copious, or too acid, or too salt, which sometimes creates *Catarrhs*; or rather, it is vitiated in its Course by the Lymphatick Vessels, whether in a natural State, or contrary to Nature, and this second Depravation of the *Lympha* creates *Dropsies*. The *Lympha* that flows continually from the *Trachea* to moisten it, and make it fit to form the Voice, from the Source of the Glands which are near the Chink of the *Larynx*, and if this *Lympha* is too plentiful, or too thick, the Voice becomes harsh and rough, if in a Catarrhus Indisposition it is too acid, being carried from the interior Tunicle of the *Trachea Artery*, it is impossible but it must be irritated, and cause an obstinate Cough.

Of Chylification, and its Passage into the Blood ;
with some Account of its Motion, together with Nu-
trition and Accretion. From Phil. Verheyen, M.D.
Professor of Anatomy in the University of Lou-
vain.

Chylification, which the Greeks call *Chylosis*, is the Conversion of Meat and Drink into *Chyle* ; for the Meat being taken into the Mouth, and chew'd there, if not fluid enough, is convey'd thence by Means of the Gullet into the Stomach, where mixing with other Liquids which are usually taken down in eating, it is converted into a Kind of Pu'p like Cream, which is called *Chyle* ; but by what Vertue or Power the said Meat or Food is digested into such a Substance, is not yet sufficiently prov'd by Reason or Experience. The Ancients chiefly affirm'd, it was perform'd meerly by natural Heat, after the same Manner as Victuals were reduced over the Fire to a softer Substance : But the Moderns reflecting upon this, will not allow, that hard Meat can be boil'd by any Degree of Fire in artificial Vessels so exactly as in the Stomach ; and affirm, that there is no such Thing as Dissolution of Meat by natural Heat alone, since that Heat does not appear to act otherwise than such as we procure by Art ; and since nothing is discover'd that so equally dissolves the hardest Bodies as acid Chymical Liquors, they are of Opinion, that there is some Liquor prepared in the Body that is analogous to that of the Chymists, though much milder, which being bestow'd upon the Stomach, and assisted or join'd with the natural Heat, separates and cuts asunder the several Particles of the Aliment by its Acuity or sharper Points. And they alledge, that this Opinion is further confirm'd from the taking of Acids in at the Mouth, by which Means the Appetite is promoted, and the Dissolution of the Victuals in the Stomach,

which happens directly contrary upon the Exhibition of Crabs Eyes, Coral, Chalk, and the like, which either take away the Appetite, or at least considerably abate it.

This Opinion, though it seems to have received its Sanction from the Testimony of many eminent Physicians and Philosophers at this Day, yet is not without its Difficulties ; for tho' Acids do create an Appetite, to Mustard, Pepper, Ginger, and other Aromaticks, that are quite opposite to Acids, make a compleat Digestion, or render the Dissolution of the Food more perfect. Besides, Want of Appetite, and a Loss of Chylification, oft proceeds from too much Acidity in the Stomach ; for *Riverius*, in his Observations, relates a Story of one who for a long Time laboured under an acid Ructation, and having no Desire to eat, was reduced to a *Skeleton*, yet afterwards restored to his former Health by taking five or six Grains of Pepper whole for some Days together upon an empty Stomach, by which Means the Ructation or Belching, together with the Sharpness, was remov'd, and the Appetite and Digestion restored. In the last Place, Acids are observ'd to curdle the Blood, Milk, and several other Things ; now the Coagulation of Bodies is directly opposite to their Dissolution.

Therefore weighing these Arguments together, I thought it the safest to stick to Experience as the best Instructor, desiring from thence to learn, whether any Liquors digested according to Art with Food, would produce in them any Likeness of Chylification : Therefore I took Bread and Butter, with some Apple chew'd together, putting

to it a little Quantity of Beer, according to the Method of Feeding in this Country, which Composition or Mixture I thought very fit for Digestion. I put different Parts of this Mixture in several different Bladders, into one of which I poured Spirit of Vitriol, into another Spirit of Salt, into a third Nitre, and into the rest different Liquids, and one I left pure and unmix'd, without any other Liquor. These little Bladders being tied differently for Distinction Sake, I put into warm Water, and continued them about eight Hours in the same Degree of Heat, which I imagined might be equal in some Measure to that of the Stomach; but when I had finish'd the Operation, I scarce met with any other Reward for my Pains, only that I found, the Method Nature took in the Dissolution of Food was not to be discover'd this Way; for whereas the Food in a healthful Constitution was perfectly reduced to *Chyle* in much less Time, here it was scarce remarkably chang'd, yet more so in those Bladders wherein I had put the acid Liquor, but not sufficiently enough to conclude any Thing for the Acid being the Instrument of Chylification.

Neither could I from the Success of this last Experiment infer any Thing against the Doctrine of the Moderns, because, as in Chymical Operations, it is not every Acid that will dissolve every Body capable of Dissolution by *Acids*; like as we see in *Aqua Regia*, that dissolves Gold, which common *Aqua fortis*, though abundantly more corrosive, will scarce touch: Therefore we say, in our Bodies it is not every *Acid* that is appropriated for Chylification, but something that is specific, and appointed by Nature for that End or Purpose; for I have observ'd in Practice, that Salt of Steel, though in its own Kind a gentle Acid, or rather a sweet Acid, much more promotes or increases the Appetite than Spirit of *Vitriol*, or other Simples, that much surpass it in Acidity, from whence perhaps it comes, that Mustard, Pepper, Spirits of Wine, and the like, are more agreeable to the Stomach.

Besides all these Things, that there is a certain digestive Humour, the Glands of the Stomach prove, which are undoubtedly like other Glands, for the Transcolation or Straining of some Humour, and it does not ap-

pear for what End they were transmitted into the Stomach, but to facilitate Digestion. But lest any Body should think that there is any Thing separated by these Glands from the Stomach into the *Gastrick Veins*, we are to consider, that the *Glands* are useless for Sequestration of any Thing from any great Cavity, and that Nature is observ'd to do nothing like it in other Places; since wherever Matter is separated, it is brought by small Vessels, and the very Fabrick of the Glands is constituted of Vessels, and the Disposition of them appears from the Texture of the *Glands*. This digestive Humour therefore, or at least its immediate Matter, is brought to the Stomach by the *Gastrick Arteries*, according to the Method of the Blood's Circulation, and by Mediation of the Stomach Glands, into the Cavity of the Stomach. I say, its immediate Matter is brought here at least, because as of some others, so likewise we may doubt of this Humour, whether or no it formally exists in the Mass of *Blood*, or rather is generated in the very Sequestration, or immediately after it, from the various Particles that are required to make up the Texture of the said Humour. In the mean time it is certain, that it is either generated in the Mass of *Blood*, or at least that its Matter is adapted or disposed for the Dissolution of the Food.

Neither does this alone, but the *Saliva* or *Spittle* is not without Reason thought to concur towards Chylification, as the Victuals held some Time in the Mouth gains a greater Degree of Whiteness, which is at least a Token of an imperfect Chylification, or that it is begun. Moreover, those whose Mouths are dry, though they are moisten'd with any foreign Liquid, yet they do not perceive, or are sensible of, the usual Taste of their Victuals; which is an Argument, that the Particles are not so divided as by the *Saliva*, and therefore do not affect the Gustatory Nerves so sensibly. In the last Place, the *Saliva* has a Power, or rather Disposition, to ferment and incide, and consequently to digest and attenuate, and will appear from the Experiments made on that Fluid, which we shall treat of hereafter.

Besides this, we swallow our Spittle frequently in a Day by it self, and it is continually mix'd with the Food which we chew, and

and still more plentifully and intimately the oftner we roll the Victuals in our Mouth, and grind it in our Teeth. Since therefore the harder and tougher Meat is divided by the greater Mastication and Dissolution in the Stomach, hence it is provided by Nature, that in the first Action it should be more water'd with the *Saliva*, and so the better predisposed for the second. Neither does it appear to me from the Dissolution of the Meat, that the remaining *Chyle* is to be ejected from the Things that were taken in before, and remain'd amongst the Folds and Wrinkles of the Stomach, because in some the active Particles are join'd together, and act of their own Accord. We ought likewise to have particular Regard to the Share the *Spirits* have in this Work, being brought to the Stomach by the Nerves of the *Par Vagus*, and afford great Assistance to the Elaboration of the *Chyle*, so that they do not only constringe the Stomach on every Side, and express the digestive Humour, but likewise pour it out from the moving Fibres into its Cavity, stirring up from thence other Instruments for making of *Chyle*, and drive forward the Matter appointed for that End.

Moreover, it is very likely that the Aliment in the Stomach being something broke, was as it were ground by its Sides in the peristaltick Motion and Agitation of the Parts adjacent. Neither is it of great Moment whether the Impulsion be very strong, or the Sides of the Stomach hard and cutting, since the Body that is to be broke or rub'd to Pieces is not so very firm and solid; and because the *Food* remains some Time in the Stomach, the Sides thereof are frequently driven against it; so that we may reasonably imagine, that the soft Aliment is diminished either previously by Mastication, or some artificial Preparation, or else in Course of Time further lessen'd by the said Impulse, to which we must allow natural Heat some Addition of Air, of which hereafter; and yet all these are not sufficient for the making of *Chyle* without the Concourse or Mixture of a digestive Humour, as appears from the following Observation:

One Day when I had dined heartily, but quick, at Noon, I took nothing in the Evening but a Draught of Small Beer, which was sufficient to dilute the remaining *Chyle*

upon the Stomach, and carry it down into the Guts. I was also very cautious, next Morning of swallowing my Spittle, and yet I was sooner and more hungry than at other Times when I used to eat a moderate Supper. But this Hunger could not be excited by the Remainder of the *Chyle*, that being undoubtedly carried off the Stomach with the Small Beer; neither by the *Saliva*, which was very small, if any at all came to the Stomach: But the Spirits were too thin and subtil, so that they irritated the Membrane of the Stomach, as is required for exciting of Hunger; neither is the peristaltick Motion or Pressure of the Ventricle capable of effecting this, because it is not less, but rather greater, upon a full Stomach than an empty one; therefore this can never be the Reason of Hunger. If Desire was raised by such a Kind of Motion, there is likewise the same Reason concerning the natural Heat, and the airy Matter, except there is something issued forth of a digestive Humour; therefore there ought to be that which vellicates the Membranes of the Stomach, by which Hunger is excited, and which ought to be something different from the aforesaid, and indeed more active. It ought (I say) to consist of acute or pungent Particles, that are proper or fit to prick upon the nervous Coat or Membrane of the empty Stomach, and upon its being full, to insinuate it self into the Contents thereof to dissolve them; which cannot any other Ways be deduced, than from the Mass of *Blood* by the Glands of the Stomach, as I have said before of the particular digestive Humour.

But since Bones are so readily dissolv'd in a Dog's Stomach without any previous Mastication, as we may observe; and since we see these Things likewise dissolv'd out of the Body by Acids, especially if Heat be added to their Assistance; hence we may suppose, that the digestive Humour in a Dog's Stomach is more acid than that in a Man's, in which such Bones are not so easily dissolv'd. Therefore from what has been said, and what we may be able to collect from Reason, Chylification seems to be perform'd after this Manner: The Meat being duly chew'd and impregnated with *Saliva*, the digestive Humour is mix'd with it in the Stomach, and the remaining *Chyle*, if any, left,

which uniting together, and excited by the natural, begin gently to ferment; from whence the active Principles being more exalted, sink the thinner Mass the deeper, which, when they endeavour to describe their Motion by a right Line, throw the impeding Parts of the Food on every Side, and separate and divide many Ways. In the mean time, while these Things are done within, the Spirits also, by the Motion of what is contained in the Stomach, are plentifully distributed into the moving Fibres, and strongly force the rough or nervous Coat thereof upon the Aliment, by that Means grinding and breaking the Parts thereof; but fresh Spirits succeeding these, continually drive on the former, which, that they may make Way for them, rush into the Cavity of the Ventricle, where they mix with its Contents, and are necessary towards procuring a vigorous and active Chylification; but the Particles of the Food being thus dissolv'd and subtiliz'd, mix the better with the potable Matter, and therewith form a certain pulpy Composition, which we call *Chyle*.

But if there was no Liquid taken in, the Solid would be difficult to be fermented, and the Instruments of Digestion would be less able to penetrate; and therefore Chylification could not succeed so happily, unless some small Matter of Liquid was receiv'd, or that the Stomach was very moist: Likewise the *Chyle* made from hence is hardly, or with Difficulty, distributed. On the other Hand, if there be an Excess of Liquid taken, the digestive Humour mixing with it; loſes its Force, and can scarce digest the Food, but passes too quick or precipitately out of the Stomach with the Liquids. The Remainder of the *Chyle* is not absolutely necessary for Digestion, from whence we may conclude, that it succeeds after a long Abstinence or Fasting.

Those who are used to eat nice and delicate Meat, that is easy of Digestion, hardly digest the stronger; and those used to stronger Food, the Sides of whose Stomachs are firmer, produce a digestive Humour and *Satura* of greater Activity. Those who labour hard, or exercise the Body well, have a good

Digestion, the Reason of which is plain, because by Motion and Agitation the digestive Humour that exists in the Stomach, as it is poured more upon the Aliment, so a fresh Supply is easily and more plentifully generated from the Mass of *Blood*, and brought to the Stomach. Hence arises a Difficulty, namely, why Digestion is less'n'd or weaken'd in hot Weather, since, according to the Modern Philolophers, Heat consists in a quick Motion of Bodies: On the contrary, when the Air is cold, and consequently motionless, the Digestion is stronger. The Reason of this *Phænomenon* is generally solv'd thus: *viz.* That the digestive Humour, by reason of the great Heat, is too much attenuated or thinn'd; and further, that it is evaporated by the great Opening of the Pores of the Skin; and though by the Exercise of the Body the Blood is greatly heated, yet there does not happen such an Apertion of the Pores, except sometimes from violent Exercise, from whence Digestion is not assisted. For the very same Reason they assert, that cold Baths increase both Appetite and Digestion; but the hot Baths on the other Hand lessen them, as those who use them can testify.

This Solution, as it is not altogether unacceptable, so it is not so satisfactory as I could wish; for tho' in Winter-time with great Exercise there is much Sweat, and a great Dissipation or Loss of Matter, yet the Appetite and Digestion is promoted; and it is not easily to be believed, that in such a Case the digestive Humour should not be considerably dissipated, since we suppose from the same Reason, that in Summer-time the Digestion languishes: Therefore it seems to be a Disparity of Reason betwixt the Summer Heat and that rais'd by Exercise; from whence I suspect, that in Chylification there is a certain Matter concurs which is taken from the Air in the Use of Respiration, which is more plentiful, and endow'd with greater Activity in Winter than in Summer-time, in watry or low Places than in mountainous ones, and which will be better understood when we come to speak of the Benefit and Use of Respiration.

*Of the Expulsion of the Chyle from the Stomach,
and its Passage to the Blood. By the same Author.*

THE Chyle made in the *Ventricle* is brought by its right Orifice or the *Pylorus* to the *Duodenum*, and that as well by the peristaltick Motion of the Stomach, as the Squeezing of the adjacent Parts, and especially of the *Diaphragm* at every Inspiration by the Resistance of the Sides of the *Abdomen*; but the Chyle rather gives Way or yields towards the Intestines than the *Oesophagus*, because not only its Passage is easier towards the *Pylorus*, but also the peristaltick Motion begins at the left Orifice, and is continued towards the right. From hence the Squeezing is greater in the left Side, where the Stomach is more extended, and therefore by that its Contents make Way to the right. Neither shall we say, that the right Orifice of the Stomach is press'd by the Liver lying upon it, because that Bowel is tied by proper Ligaments on the upper Part to the mucronated Cartilage, on the lower Part to the Navel-string, and at the Time of Inspiration draws more upwards, than downwards and forwards. Hence, at the same Time that the Capacity or Hollow of the Stomach is most squeez'd by the neighbouring Parts, the *Spleen* is from the said Ligaments made tenser, and lies less on the right Part of the Stomach.

The Chyle being driven into the Gut *Duodenum*, is water'd afresh with new Liquids, to wit, the *Gall*, and *Pancreatick Juice*, with which the Chyle is still render'd more fluid, and therefore apter to continue on its Motion; the Vessels lubricated, and therefore afford an easier Passage; and what I reckon the chief Thing, the purer Part of the Chyle by Way of Precipitation is separated from the more saculent, that from thence the Orifices of the Lacteal Veins might the readier admit it. But we shall say more of this Fluid in its proper Place. The Chyle, with the like Power with which it was expuls'd

from the *Ventricle*, to wit, by the peristaltick Motion and Squeezing of the Parts, is convey'd further by the Intestinal Duct, and in its Passage by Degrees or little and little deposite the purer Part into the *Lacteals*, to which the *Valvula Conniventes* or the Foldings of the Guts are much contributing, and crooked Situation and Inequality or Unevenness of them, by which Means the Chyle cannot so readily continue its Passage towards the *Anus*. This peristaltick Motion likewise not only contributes to the Translation of the Matter, but also seems to conduce much towards the opening of the Orifices of the *Lacteals*, since there are constrictory Fibres so knit to their Sides, that being contracted by them, they mutually open to one another; for unless we suppose the Matter so, I can see no Reason why *Wind*, that is thrust into the Guts, should not break through the Orifices of the *Lacteals*.

The grosser and more excrementitious Part of the Chyle, which is denied Entrance into the said Orifices by the Constriction of the said Fibres, and otherwise, forces its Motion, notwithstanding the Difficulty of its Passage, towards the *Anus* for Exclusion. But lest Necessity should compel Men too frequently to exonerate, several of the Guts are very large, in which the *Fæces* are collected, till they grow in too great Quantities, or being burthensome, are ejected, ordinarily by the Force of Inspiration, Vomiting, the peristaltick Motion, and Pressure of the Parts: But the purer and balsamick Part taken into the *Lacteals*, is by Degrees convey'd from the minutest Branches to the large, and at length by Ducts into the great Receptacle of the Chyle, call'd *The Cistern*, from whence it passes by the *Thoracick Duct* to the *Subclavian Vein*, and thence with the Blood, to which mixing it self, it passes to the *Heart*, and from thence undergoes various

Motions,

Motions, Alterations and Changes, as we shall further show in the Motion and Conformation of the *Blood*.

The Passage of this *Chyle* appears evidently in a live Dog, if the *Abdomen* be open'd an Hour or little more after the taking in of a good Quantity of Milk; for the Milk, because fluid, passes easily from the Stomach, and by its Whiteness makes the strait Passages thro' which it flows appear plain. 'Tis manifest, that at the Insertion of the *Thoracick Duct* the *Chyle* in Dogs mixes with the *Blood*, first of all in the anterior *Crunal Vein*, usually the left. I have found the same Duct in an Ox implanted at the right *Crunal*; but in Man, whose Figure is erect, they are not join'd to the anterior *Crunals*, but the *Subclavians*, which are united after the

same Manner to the Trunk of the *Vena Cava*, as the anterior *Crunals* are join'd to the same Trunk in a Dog; so that there is no Doubt but that the *Thoracick Duct* in a Man is ingrafted into the *Subclavian Vein*, as ocular Demonstration shows. But though this Duct is seen inserted into the left *Subclavian*, though few have seen that, I dare not be so bold as to assert, that the same Duct terminates in the left *Subclavian*: And though the bitterest Gall is pour'd into the *Chyle* as it permeates the *Duodenum*, yet it does not appear either in the *Lacteals*, or the *Cistern*, to be ting'd with Bitterness; for having often taken *Chyle* from the *Cistern* of a Dog, and tasted it, and given others that were By-standers to tast, we none of us could discover any Sense of Bitterness in it.

Of the Circulation of the Blood. From the same Author.

I Thought it necessary, before I came to speak of the Motion of the *Blood*, to inquire into the Nature of *Chyle*, and the Method of *Sanguification*, which I have set forth in as succinct and clear a Manner as I was capable of. The *Blood* then, has two Motions, to wit, an Intestine Motion, and a Circular Motion; the first of which we shall reserve till we come to treat of *Fermentation*, &c. and here confine our selves to that of *Circulation*. The Circular Motion or Circulation of the *Blood*, is that Motion which passes from the Trunk of the *Vena Cava*, and some other Branches, into the right Ventricle of the *Heart*, and from thence, by the Constriction of the *Heart*, into the *Pulmonary Artery*, by whose Branches dispers'd through the Lungs, it is brought into the Branches of the *Pulmonary Vein*, and from thence by its Trunk into the left Ventricle of the *Heart*, from whence, by the Constriction of the *Heart*, it is driven into the *Aorta*, and by the Assistance of its Branches, distributed through the whole Body; and that which is neither bestow'd upon the solid Parts, or any other Ways out of the

Road of the Circulation, passes thro' from the Branches of the *Aorta* into those of the *Veins*, and at last through the Trunk of the *Vena Cava* back again to the right Ventricle of the *Heart*, as before.

This Motion of the *Blood*, which we call *Circular*, because it returns to the Place from whence it first set out, is prov'd after this Manner: First of all, from the Constitution of the *Blood Vessels*, which lie near to the great Trunk or Ventricles of the *Heart*, and by Degrees receding from the *Heart*, are divided into several Branches; for this Fact appears from no other Reason, than that the *Blood* is plentifully thrown in from what we call *Veins*, into the Cavity of the *Heart*, and from thence driven out again into those called *Arteries*; observing, that the *Valves* before the Gates or Mouths of the *Veins*, admit the *Blood's* Entrance into the *Ventricles* of the *Heart*, but stop its Return into the *Veins*; but the *Valves* in the *Arteries* have the quite contrary Use. Hence it is manifest, that the *Blood* moves by the *Pulmonary Artery* from the right Ventricle, and by the *Vein* to the left, in like Manner from the left Ventricle
into

into the Trunk of the *Aorta*, and from thence into the Branches of it, till at last it come to the utmost Extremities. It is likewise apparent, that the same *Blood* passes into the *Vena Cava* from the straighter Branches into the broader, and from thence to the Trunk, and therefore from the remote Parts to the right *Ventricle* of the *Heart*.

Those fine or slender *Valves* that are in the *Veins* prove this Passage sufficiently; for they are frequently found larger about the Insertion of Branches, and are so situated, that they may perpetually impede or hinder the Return of the *Blood* to the Extremities, but never retard its Passage from the Extremities to the Cavities of the *Heart*. Since therefore the *Blood* is return'd by the *Veins* to the Cavities of the *Heart*, from whence it issues out, it follows necessarily, that it moves circularly, and these *Valves* are describ'd in Vol. 2. of this Work, in the Description of the *Veins* and *Arteries*. In the next Place, This Circuit of the *Blood* is prov'd from the Pulse of the *Arteries*, whereby the *Blood* is manifestly propel'd in greater Quantity from the *Heart* into the *Arteries* than is required for Nutrition of the Parts, or can be recruited by the new Succession of the *Chyle*; therefore it is necessary that it should return to the *Heart*, and from thence circulate about the Body.

In the third Place, The Circulation of the *Blood* is plainly proved by the following Anatomical Experiment: In a live Dog the *Vein* and *Artery* being laid bare, which is most conveniently done in the posterior *Crunal* about the Flank or Groin, by tying the Parts with a Bandage; which being done, the Part of the *Artery* next the *Heart* will appear swell'd, but that below the Ligature, the furthest distant from the *Heart*, sunk; but in the *Vein* it will be directly the contrary, the *Vein* swelling under the Ligature, and sinking above it, or nearest to the *Heart*. But if the swell'd *Artery* be open'd by a *Lanceet*, the *Blood*, especially if the Dog be lively, will break out impetuously, and spring several Foot high, and if the *Artery* remain open any Time, the *Blood*, together with the Life of the Dog, will soon have finish'd its Course. But if an Apertion be made below the Ligature, nothing, or at least a very insignificant Matter, will flow thence; but if

you strike the *Vein* in the same Place, there will be a plentiful Effusion, but not with such Force as from the *Arteries*. Hence it is evident, that the *Blood* that issued out from the Cavity of the *Heart* by the *Arteries*, returns to the same Place by the *Veins*, and consequently moves circularly.

Every Part of the *Blood* does not always describe an equal Circle, but sometimes a shorter, and sometimes a longer, conformable to the Situation of the Parts, and the Length of the Vessels. Hence that *Blood* makes the longest Circle that moves by the Extremities of the Limbs, to wit, by the Toes and Fingers, and that the shortest that passes through the Substance of the *Heart*, the Auricles, and other Parts about the *Heart*. Neither does all the *Blood* run thro' many Vessels in every Round, for the greatest Part of it performs its Course thro' each *Ventricle* of the *Heart*, by the *Pulmonary Vein* and *Artery*, thro' the *Aorta* and *Vena Cava*; but that Part which reaches the Brain, besides the said Vessels, permeates also the *Sinus* of the *Dura Meninges*, and its Branches; and that which circulates through the *Stomach*, the *Spleen*, *Pancreas*, &c. passes from the Branches of the great *Artery* into those of the *Vena Porta*, and from thence, by the Mediation of its Trunk, and those Springs which creep through the *Liver*, into the Branches of the *Vena Cava*, as the Composition of the said Vessels sufficiently demonstrate.

In the Definition of the Circulation of the *Blood*, I have not affirm'd positively that this passes from the *Vena Cava* into the right *Auricle* of the *Heart*, or from the *Pulmonary Vein* into the left *Auricle*, as all the Moderns have hitherto done, thinking, that all the *Blood* enter'd this or that *Auricle* before it came at the correspondent *Vein*; but this is erroneous, because there is no Appearance that all the *Blood* comes to the *Ventricles* of the *Heart* directly from its *Auricles*, but its greatest Portion enters them immediately from the *Veins*, which is proved thus:

First of all, The Way is much directed from the *Vena Cava* to the Cavity of the *Heart*, than to its *Auricle*, which the *Blood* cannot enter without receding from its strait Passage, as *Anatophy* will demonstrate from the Insertion of both the upper and lower Trunk

of the *Vena Cava* directly into the right *Ventricle* of the *Heart*, so that the *Blood* cannot fill the *Auricle* without rising upwards, which is more difficult for it, considering the Stream with which it is brought into the *Heart*, so that the *Auricle* is not fill'd with the *Blood* till the *Ventricle* is replete or contracted. In the next Place, It is impossible at that Time when the *Blood* flows from the *Auricles* into the *Ventricles*, to enter the same *Auricles* another Way, because the first *Blood* hinders the Passage of the latter, and so *Vice versa*: Therefore the *Blood* which comes by the *Veins* at the same Time, enters directly into the *Ventricles* of the *Heart*; for this Entrance is not stop'd by the Motion of the *Blood* coming out of the *Auricles*, since, as I have said, these are laterally opposite.

But when the *Ventricles* are full, or contracted, that they expel the *Blood* contain'd in them, there is not a free Entrance into the *Heart*, from whence the *Blood* at that Time, because it comes without Intermission by the *Veins*, is forced to turn aside to the *Auricles*.

The Description of *Circulation* usually begins from the *Vena Cava*, because from thence the fresh *Chyle* enters into the *Blood*, and first begins its *Circulation* therewith: Thence it has been rather thought to begin here than any other Part. In the mean time, I do not see it is of such great Moment, but that we may assign the Beginning of *Circulation* from any other Place. The *Circulation* of the *Blood* may likewise be briefly describ'd without making Mention of so many Passages, namely, the Motion of the *Blood* from one *Ventricle* of the *Heart* through the *Arteries* and *Veins* to the other, and from thence back again by other *Arteries* and *Veins* to the former. But 'tis certain, the Ways of *Circulation* ought to be known and well understood by the Physician.

In the first Description of *Circulation*, which is more exact to that from the Trunk of the *Vena Cava*, I have added the *Coronary Vein*, and several of its Branches, which before I never mention'd, neither has it ever been done by any before. I say, I added, because now it is sufficiently evident, that not all the *Blood* that enters the right *Ventricle* of the *Heart* comes by the Trunk of

the *Vena Cava*, either proximately, or by Mediation of the right *Auricle*, but that some Portion of it is brought by the Branches of the *Coronary Vein* of the *Heart*, the Mouths of which lie open into the said *Ventricle*, as appears in the Anatomy of the *Heart*, Volume the Second, from *Verbeijen*.

Amongst the Ways or Passages of *Circulation*, the little Cavens of the Carnous Fibres are deservedly to be enumerated; for by tying an *Artery* that leads to this or that Muscle, its Operation or Action will from thence cease, which is a Sign that the *Arterial Blood*, equally with the Animal Spirits, is requisite towards the Contraction of the Muscle. From hence, if you divide the Belly of a Muscle according to the Duct of the Carnous Fibres, this not being much injur'd, nothing, or at least a very little Matter of *Blood*, will flow from thence, but a great deal, if you cut them crossways: Therefore it shows, the *Blood* flows plentifully thro' them, of which there is a great Need for their Nutrition, as well as *Circulation*; but thro' the Stomach, Guts, and other neighbouring Parts, there is observ'd to be a certain select or choice Matter that flows thro' them, not much unlike the *Lympha*, which is necessary for their Contraction after the same Manner as *Blood* is for the Carnous Fibres.

The *Blood* runs swifter thro' the *Arteries* than thro' the *Veins*, because the latter not abounding so with contracting Fibres, are not so capable of protruding the *Blood* thro' them, and this Motion being debilitated or weaken'd in the *Veins*, it is communicated to the Parts about it; but in the *Arteries*, except the *Pulmonary*, it is much more subtle and fluid, and consequently apter for Motion: From whence also the *Veins* that answer to the *Arteries* are always wider, when they should be just the contrary if the *Blood* flow'd thro' them with such a rapid Course; for the *Veins*, except the *Pulmonary*, and in that Part of the *Cava* which is betwixt the right *Ventricle* of the *Heart* and the Insertion of the *Thoracick Duct*, carry nothing considerable in them which they receive not from the *Arteries*, and yet from them a remarkable Part is carried into the Lymphatics, another into the Nutriment of the solid Parts, another for Milk, Gall, Urine,

Urine, &c. and therefore it follows, a much larger Quantity of Humours is brought by the *Arteries* than the *Veins*; but the larger Space or Room in the *Veins*, shows there is a greater Quantity of *Blood*, which, since it ought to be drawn from the *Arteries*, it cannot have, unless because the *Blood* remains longer in the *Veins*, and therefore proceeds with a slower Motion.

The *Blood* likewise flows swifter thro' the internal Parts, because in the external Parts its Freedom of Passage is frequently hinder'd by the Compression of Bodies, with which those Parts are stop'd, and that also not seldom by the circumambient Air, which condenses the *Blood*, and so renders it less fit for Motion. It happens, that the lesser Vessels in the Habit of the Body are on all Sides distributed, and many Ways recede from a right Line, from whence the Passage of the *Blood* is likewise made difficulter: And lastly, as far as ever I could observe, the small *Arteries* contain more proportionably than the larger from which they are derived.

The Inquisitive *Leeuwenhoeck* has endeavour'd to prove, that the *Blood* does not flow swifter thro' the great Vessels than the less, being made towards the End with a double Tube, and in some small middle ones betwixt both, which constitute a continued Duct with the larger; and indeed he proves well, that the Liquor emitted by one of the greater Tubes, is moved equally swift by another, and what relates to the less, except they all have the like Capacity, the Liquor will be as swiftly moved by the lesser Tubes. This evidently appears in a *Funnel*, the upper Part of which, tho' it be an hundred times as large as the Pipe or lowermost Part, and every where of the same Breadth, yet the Liquor contain'd therein could not descend to a certain Space, as for Example, a Finger's Breadth, except at the same Time so much Liquor descended by the Part of the Pipe, as amounted to the Finger's Breadth; and hence this Liquor flows at the Pipe of the Funnel an hundred times as swift as at the broad Part. The same Thing is evident in Rivers and Brooks, where the Water is observ'd to run swifter according to the Straightness of its Banks.

But this Proof of *Leeuwenhoeck's* is nothing to the Purpose, where it is objected to

him, that the *Blood* makes a slower Progress in the Extremities of the Body, and swifter in the Vessels seated near the *Heart*; therefore not because there the Vessels are small, and here larger, but for the Reasons aforesaid. Add to this the Disparity betwixt the Motion of our *Blood* and the Liquor contained in these Tubes, whose Sides are stiff, as being made of Tin or Lead; but the Vessels of the Body, as Occasion serves, are dilated and constring'd. Also the *Blood* circulates swifter thro' the *Heart* than thro' several other Parts of the Body, to wit, where the Motion is retarded in the inferior Parts, as in the Hands, because of the Ascent of the *Veins*; here on the contrary the Motion is accelerated by their Descent.

And tho' likewise the Gravity or Weight of the *Blood* may seem to retard its Motion in climbing up by the *Arteries* to the *Head*, because that which tends upwards by the *Arteries* is more spirituous and apter for Motion, and its Passage, by reason of the Directness of the Passages, easier, this said Weight thus coming into the *Arteries*, is not to be consider'd; but that the *Blood* which is hurried upwards, is more spirituous than the rest, and therefore apter for Motion. Although we cannot precisely determine how much Time is required for the whole Mass of *Blood* to pass through the *Heart*, and consequently to perform its Circulation, yet we may be able to collect something from what follows:

First of all, That opening the large *Artery* of a Man, a Dog, or other sanguineous Animal, the *Blood* will rush out with such Force, that unless it be stop'd, Life will presently be at an End; as the Famous *Lower* observ'd, in cutting both the *Carotids* of a large Dog, the whole Mass of *Blood* flow'd out in the 20th Part of an Hour, and all this *Blood*, except what issues out at first, from that Moment ought to pass through both *Ventricles* of the *Heart* and the *Lungs*.

I confess indeed, the *Blood* in this Case does not describe the usual Circuit of it, since it was not propel'd to the extreme Parts of the Body, and its Course, by reason of less Resistance, was made the swifter; but it is probable that the Motion of the *Blood* had it flow'd from the Extremities, might have been much retarded, when neither ha-

ving any fresh Matter added to it, or the Assistance of the Spirits, it could not be sufficiently driven forwards; so that considering all together, from the said Experiment we may conclude, that the whole Mass of *Blood* perfects its Course, and passes through the *Heart* often in an Hour.

In the next Place, The *Pulse* of the *Arteries*, at least in that Part we feel, consists in the Expansion of them by the *Blood* that is driven into them at every Constriction of the *Heart*; but since the *Arteries* are divided into almost an infinite Number of Branches that all *pulse*, it is necessary there should be a large Quantity of *Blood* thrown out from the *Heart* at every Pulsation, which is sufficient for the Expansion of all of them; and since in an Hour's Time there are above Three thousand Pulses made in a healthful Man, in some more, and others less, it is plain, that the whole Mass of *Blood* ought to be driven through the *Heart* frequently in the said Time.

But how much *Blood* flows from the *Heart* at every *Pulse*, we may make a nearer Calculation from the Capacity or Size of the *Ventricles* of the *Heart*, which, according to the common Assertion of Anatomists, in a Man of a moderate Stature contains two Ounces of *Blood*, or more; from whence *Lower* concludes, that there are so many Ounces expel'd from each Ventricle of the *Heart* at every Pulsation; but because the Measure of the *Ventricles* cannot be taken but in dead Bodies, in which the Parts are shrunk, and the *Blood* much condens'd, and because very likely the whole is not driven out at every Contraction of the *Heart*, but some remains behind, hence perhaps some may contend, that there is not such a Quantity expuls'd at every *Systole* of the *Heart*: Therefore let us suppose, that only one Ounce is sent forth from each *Ventricle* at a Time, it will follow, that there passes every Hour thro' the *Heart* at least Three thousand Ounces of *Blood*, which makes Two hundred and fifty Physical Pounds, each containing twelve Ounces; from whence supposing, that every Man contains in him fifteen Pounds of *Blood*, then the whole Mass ought to pass through the *Heart* sixteen times in an Hour; but if there be not above twelve Pounds of *Blood* in the Body, then twenty times. Neither

do I doubt, but in those, who from a larger Make of Body, and greater Size of the *Blood Vessels*, have a greater Quantity of *Blood*, and also larger Cavities of the *Heart*, so they pulse out much more *Blood* at every Contraction.

The Accurate *Leeuwenhoeck* considering with a Microscope the Course or Circuit of the *Blood* in an *Eel*, observ'd it to be of that Swiftness, that in an Hour's Time, in going out and returning in, it made Two hundred and eighty eight Inches, twelve whereof make a Mathematical Foot, and therefore Four and twenty Feet in the whole; but how much the Course might be of the *Blood* in a terrestrial and more perfect Animal, he could not well understand, from the vast Number of *Blood Vessels*, which make the Body, as he said, of a red Colour: Therefore the Course of the *Blood* observ'd in the *Eel*, he thus applies to the Course of the *Blood* in a Man. If we suppose the *Blood* in our Bodies to be brought thro' the *Arteries* with the same Swiftness as that in an *Eel*, and the Extremities of the *Feet* or *Fingers* distant from the *Heart* four Feet and a third Part, or Fifty four Inches; therefore the *Blood* ought to be measured from the *Heart* to the Toes, and from thence to the *Heart*, nine Feet, or an Hundred and eight Inches; from whence it follows, that the *Blood* goes about from the *Heart* to the extreme Parts of the *Feet*, and back again, twice in a Hour and two Thirds. In like Manner he computes, that the *Blood* makes an entire Circulation four times in an Hour from the *Heart* through the Extremities of the *Fingers*, and more than that by a third Part; eight times in an Hour to the utmost Parts of the *Head*, and so in like Manner to the Parts nearer to the *Heart*.

The chief Cause of the Circulation of the *Blood*, is the Propulsion of it from the *Heart* into the *Arteries*, and the Constriction of the *Arteries*, which will be more fully consider'd in treating of the *Pulse*. The Use of this Circulation is, that the *Blood* may be convey'd to all the Parts of the Body, both for Nutrition and Accretion, as well as the Conservation of the Heat and Tone of the Parts. The Spirits and excrementitious Humours are by this Means mutually assisted and join'd together, and likewise secreted from

from the other Mass, the Blood it self preserv'd from Corruption, and the Materials from hence supply'd for *Semen* in Men, Milk in Women, and other Things requisite for Generation, and the like; from whence it is plain, an infinite Number of Advantages arise to the Body, so that if this Motion be stop'd, it is impossible to support Life. What

remains to be discuss'd, as to the Circulation of the Blood in a *Fetus*, that passeth not thro' the *Lungs*, and both *Ventricles* of the *Heart*, as in Adults, we shall examine particularly by it self, with what has been said on that Subject by Messieurs *Mery*, *Tauvry*, *Bussiere*, *Verheyen*, &c.

Of Fermentation in general, in order to the better understanding of Animal Fermentations, and the Motion of Animal Fluids. Taken from the Philosophical Transactions of the Royal Society, and the following Authors, viz. Des Cartes, Mr. Boyle, Dr. Willis, Drake, &c.

BEfore we proceed to give any Account of the Production, Motions, and Alterations, of any of the other Fluids of a Humane Body, it will be necessary to premise something concerning *Fermentation*, to which the Generation, Perfection, and Decay, of Animal Fluids, has, by a Consent almost general, been ascrib'd. Fermentation is a Word, that has been so much, and so variously, us'd by Authors, that it is become very equivocal, and the Foundation of many unnecessary and unedifying Disputes, meer *Logomachia*. To obviate therefore any Misapprehensions or vain Contests hereafter about the Meaning of a Word which we shall have frequent Occasion to use, we shall be obliged to have Recourse in this Place to Definitions and Divisions, a Method (tho' some may think it too formal and scholastick) indispensibly necessary to avoid Cavils, and future Alterations, about Words we shall not trouble our selves to defend, but take Care to be understood, leaving Elegance and nice Propriety of Terms to those who study them for other Purposes.

By *Fermentation* in general, we mean such an intestine expansive Motion of the constituent Parts of mix'd Bodies, as tend to a permanent Altera-

tion of the Body fermented. By this we exclude all *Effervescencies*, *Ebullitions*, or intestine Agitations of Bodies reputed simple, by Violence of Fire, or other external Heat, which leave them, after cooling, in the same State they were before; such as the boiling of Water or Milk, the melting of Metals, &c. For tho' in some of these, this Agitation from Fire will produce such an Alteration in the Bodies, as will, in cooling, give the heavier Parts Leave to subside first, and so leave on the upper Surface something different in Appearance from the rest of the Body; as in Milk, the Skim or Cream; and in Metals unpurg'd, the *Recrementa* or *Dross*: Yet this, in the Case of *Milk*, being no more than an Acceleration of that Separation, which, without this adventitious Force, would naturally have happen'd; and in the other, such a one as would never from any *Prædisposition* in the Body have arriv'd; they might both be look'd upon as violent Separations, not properly arising from the Disposition of the Mix'd, to which we restrain the Sense of the Word *Fermentation*.

However, as *Fire*, or any other *Heat*, properly modified, serves to suscite and promote in Bodies naturally disposed *træ Fermentations*,

mentations, as in *Muß*, and other naturally fermenting Liquors, the Heat of the Weather, or any other analogous artificial Heat, will do, we only exclude those which are suddenly and violently produced by Fire. If any one will have those we have excluded to be true Fermentations, we will not contend with him, provided, that as often as we mention *Fermentation*, he will not understand it of those two Sorts, it not being the Intention of this Design to dispute what may or may not properly be call'd *Fermentation*, but settle the true Understanding or Meaning herein.

The Alterations produced by Fermentation are in general Two: The Union of Bodies before distinct, or at least the stricter *Incorporation* of such, as (tho' looely mix'd) were before not well united; or the manifest *Separation* of such as were before, as to Sense at least, united and incorporated, and bore the Face of an uniform Body. *Fermentation* produces sometimes *Incorporation* by simple *Solution* only, wherein the Body less fluid, is dissolv'd and sustain'd by the more fluid Body, and both together seem to make one Liquor or Substance. In this Case, the Fluid sustaining is generally call'd a *Mensstruum*, as in Tinctures of *Resinous*, *Metallick*, and other Bodies. This is generally artificial.

Sometimes this *Dissolution* springs from a natural Tendency of these Bodies to ferment and separate, or at least to cohere more loosely than before, as in the *Putrefaction* of Animal and Vegetable Bodies, which is a Degree of this *solutive Fermentation*, that so entirely dissolves the Union of the Parts, as to render them not only foetid, but incapable of ever being reunited under the same Form, the more volatile Parts being so disengaged from the rest, as to strike the Organ of Smelling at some Distance by their *Effluvia*, as all Animal Substances, if left to themselves, will in some short Time do, and in some morbid Cases, besides the Excrements which do it constantly, some Parts of the living Animal, as in *Ulcers*, *Apostemations*, &c. which *Effluvia* so sent out, are not to be recollected by Art.

A lesser Degree of this Sort of *Fermentation*, which does not so absolutely enfranchise the volatile foetid Parts, yet so far dis-

solves the whole mix'd, as to loosen the Coherence of the Parts, and to dispose them towards, or give them a Degree of, Fluidity, which they had not before, without sending out any offensive Exhalations, is called *Digestion*, and is that State to which the Aliment is reduced in the Stomach of Animals.

There are other *Fermentations*, which are *Depuratory*, and separate something from the mix'd, without destroying the Form of it. This is done two Ways, either by sending a permanent Froth or Scum, as new *Wine*, *Ale*, and other fermented Liquors us'd for Drink, and is attended with a strong and lasting *Efferveſcence*, to which if Vent be not given, it bursts the Vessels, be they never so strong, and is vulgarly call'd *Working*, by Artists *Despumation*. This is either spontaneous or natural, or artificial or forced. The other is by *Precipitation*, or letting fall some recrementitious Parts, which is usually the Consequence of a light *Fermentation*, without much Tumult or Disturbance, in which some Parts, that before floated separately in the Liquor, unite, and growing too heavy to be sustain'd in it, fall down to the Bottom, leaving the Liquor clearer than before, as the *Lees* and *Tartar* of Wines. This is called *Fretting*, and is attended with a slight *Spumesce*. This too is sometimes spontaneous, sometimes forced by Art.

There is however another Sort of *Precipitatory Fermentation*, which is attended with a more immediate and violent *Efferveſcence* than any of the former. This happens not only between those Bodies which the *Chymists* are pleased to call *Acids* and *Alkalis*, and is instantaneous, but follows as soon as the Bodies touch one another, and sometimes before they seem to do so, that is, as soon as their *Effluvia* or *Exhalations* meet. These are generally *saline* Bodies, and when both of them happen to be in *Fluore*, they constitute those Liquors which the Artists call *Spiritus macri*, *saline*, *lean* or *hungry Spirits*, because they suppose them destitute of *Sulphur* or *Oil*, at least they appear so to them, being not inflamable, which is their Mark of *Sulphur*, however fallacious. To produce these *Coagulatory Fermentations*, one at least of the Bodies must be a lean Spirit; if both be so, a violent *Ebullition* is produced immediately

upon

upon their Mixture, which soon ceasing, a *coagulate Salt*, compounded and partaking of both, is let fall to the Bottom, as *Tartar Vitriolate* from Oil of *Vitriol* and Oil of *Tartar*.

If the *Alkalious* be a dry Body, whether *testaceous* or *saline*, the *Acid* let fall upon it, raises an immediate and considerable Effervescence, tho' not so great and violent as between the Fluids, yet greater with the *saline* than the *testaceous*, and more durable with both than between the *Fluids*. When the acid Salt has insinuated it self into the Body of the *Alkali*, the Ebullition ceases, and a mix'd or neuter Body is form'd out of them, which Manner of concorporating different fermenting Bodies, is by the *Chymists* likewise call'd *Coagulation*, as the *Magistry* of *Pearl* from Powder of *Pearl* and *Vinegar*, or any other *Acid*.

There are divers other Sorts of *Fermentation*, not reducible to any of these Heads, which it would be endless to enumerate, they appearing to be almost as various and numerous as the several Bodies that will ferment with one another. But the Effects of most of these *Fermentations* ending with the Act, *viz.* neither producing any *Despumation*, *Precipitation*, *Coagulation*, or any other Separation, or other permanent Alteration whatsoever, other than simple Mixture would do, it may be sufficient to mention the principal Accidents that attend several of them during the Activity of their *Ferments*. These may be call'd *Anomalous Ferments*, since they are not to be brought under any certain *Classis* or *Rules*.

Among these *Anomalous Kinds*, may be reckon'd that *Fermentation* which is rais'd in Dough by *Yeast* or *Leven*, in which, altho' there be a notable Intumescence or Swelling of the Mass, yet it produces no other considerable Alteration in the Property; neither is that lasting, unless the Mass be baked in an Oven, or otherwise harden'd by the Fire, which hinders the Parts from subsiding again, as left to themselves they naturally would do. *Bread* is indeed accounted the more wholesome, and easy of *Digestion*, for this *Fermentation*, whence some would infer an essential Alteration in the Qualities of the *Mass*: But that is a Mistake; for that Lightness and easiness of *Digestion* is altogether

owing to the Rarity of the *Texture* introduced by the *Leven* or *Ferment*, assisted and promoted by the Heat, whence the Parts touching one another in fewer and smaller Surfaces, become more easily separable in the Stomach.

Of the same Kind is the *Fermentation* of some *Pharmacopæal* or Shop Preparations, made of a Mixture of Ingredients, some aromattick and volatile, others viscous, whose Intumescence arising from a Tendency of the volatile Parts to escape thro' the viscous, is not attended with any Separation, or other manifest Alteration of the Qualities of the Mixture, which, after the *Fermentation* is over, being well agitated, as such Preparations usually are, bear one uniform Face, as other officinal unfermented Electuaries do. Of this Sort are *Venice Treacle*, the *Philonia*, &c. made with Honey, or other viscous fermentative Substances. These *Fermentations* being sluggish, tho' the Intumescence be great, produce no very notable Degree of Heat.

There are other *Anomalous Fermentations*, which tend neither to the Perfection nor Union of the Bodies fermenting, yet are attended with a prodigious Ebullition, and most intense Heat, even to actual *Inflammation*, between some of 'em, as between strong *Aqua fortis*, or Spirit of *Nitre*, and rectified Oil of *Turpentine*, or distilled Oil of *Cloves*, &c. which end in the Destruction of the Subject, leaving nothing but a *Calx* behind. An actual Flame or consuming Fire is sometimes likewise produced by occult or smother'd Fermentations, as Countrymen to their Loss experience, when their new Hay is made up into great Cocks or Ricks before it be well dried.

An intense Heat may likewise be produc'd by Fermentation without any visible Effervescence, as when Oil of *Vitriol* is mix'd with Water, which will heat a Glass or metalline Cup so as not to be endured by the naked Hand, yet without any Ebullition. The same, or indeed much greater, Heat it produces pour'd upon Spirit of Wine, with the same Appearance, except a Change in Colour, and upon *Vinegar*, and most of the *Acids* of the lower Class.

To solve the great Variety of different Appearances arising from the several Sorts of

Fermentations, *Hypotheses* almost numerable have been fram'd which their Authors have endeavour'd to accommodate to the many surprizing *Phænomena* which this one Part alone of natural Mechanism furnishes. But with how little Success they have generally attempted these Difficulties, as it may perhaps be thought Arrogance to say of the Labours of Men so eminent, and so much more able, so it must be thought Ignorance not to know, since, by the Nature of this Undertaking, we are oblig'd to offer our own Sense concerning 'em, tho' perhaps what we shall offer, may only add to the Heap of exploded Opinions.

The narrow Limits to which we are in this Place circumscrib'd, will prevent us from entering into the Lists too far against great Men, to whose Judgments we readily submit as far as Truth will give us Leave, we are not here solemnly or formally laying down a compleat *Theory* of *Fermentation*, nor oblig'd to refute every *Hypothesis*, which we think to be insufficient, nor even so much as to account for all those different *Phænomena* which we have already mention'd: But for those only, which have a Share in the Animal Oeconomy, and especially in those Parts of it, of which we shall be oblig'd to speak in treating of those *Problems*, which seem necessary to this Work.

Common Consent of Physicians and Naturalists has in a Manner reduc'd the general *Theory* of *Fermentation* to two *Hypotheses*; one descended from the Doctrine of *Democritus*, *Epicurus*, and their later Followers; the other from *Paracelsus*, *Helmont*, and the modern *Chymists*. The first pretend to solve all the Difficulties occurring in this Part, which is none of the least or most intelligible of Physical Knowledge, by the Concourse and Agreement of Atoms, which, according to them, are the Seeds of all natural Bodies, and *Principles* of all Physical Action floating in the *Atmosphere*, and which, by their fortuitous Concourse or Concurrence, either unite and settle quietly, or, by their Contraniticity and Reluctance, occasion all these natural Bustles of which we have been speaking, which the Diversity, Contrariety and Infinity of these *Seeds* or *Principles*, they think make not hard to be conceiv'd.

The *Cartesian Notion*, which most of the French Philosophers embrace, in this Point at least, is a Refinement upon the foregoing, and establishes a subtle Matter or *Æther*, which having a constant rapid Motion pervades the Pores of all Bodies, *fluid* or *solid*, *Diaphanous* or *Opake*; and while the Pores of the pervaded Bodies keep their wonted Station and Disposition, the *Æther* passes swiftly, but quietly through them, without rustling or discomposing the Body however fluid and easy disturb'd. But if by Mixture, accidental Means, the Course of these Pores be so interrupted and broke, as create any Obstacle to the Passage of the subtle Matter, it raises Commotions gentle or violent, till it has open'd a free Passage for it self, or has rent the Body to Pieces. This Doctrine they illustrate by the celebrated Instance of the *Glass Drops*, which, by breaking off the Tip, are shatter'd into a Million of Pieces in an Instant.

Though neither of these Opinions contain any Thing absurd, or that can be demonstrated to be untrue, yet without Offence we may say, they are unsatisfactory, as being too general, and abstracted, even so far as to be alike applicable to every *Phænomenon* and in equal Degree which will not answer particular Circumstances. For if we be ask'd, why *Yeast* mixt with *Ale* or *Dough* makes 'em swell or *Ferment*; according to the *Atomist's Hypotheses* we must answer, that the Intumescence springs from the Jarring or Disagreeing of *Atoms*, that cannot lie quietly together: According to the *Cartesian System*, that the Continuity of the Pores, being by this Mixture broken, the Tumult is rais'd by the *Æther*, which is seeking or forcing a new Passage. But what is the Disagreement of the *Atoms*, or Interruption of the *Pores*, and wherein it consists, and why the *Fermentation* is one Case hasty, violent and short, in another, slow, languid and durable, are Questions that these abstracted *Theories* make no Answer to. And when those that Philosophize from 'em undertake to do it, their Answers are generally such as have no Dependance upon their *Theories*, or so Precarious or Arbitrary as a Judicious Inquirer cannot acquiesce in, and he might as well take up with the old *Heripatetic*

patetick Juggle of *Sympathy* and *Antipathy*, which he might deal about and distribute as in his Discretion he should think fit.

By the great Number and Variety of Experiments which the *Laboratory* and *Furnace* supply, the *Chymists*, or as they affect to call themselves, the *Philosophers* by *Fire*, seem better furnish'd for an Argument of this Kind than any others. But howsoever it has fallen out, whether through the Arrogance or affected Obscurity of some, and the slender Literature of others, which have render'd them unfit for a free and rational Philosophy, they have been no happier than the rest, though more conceited, and have generally reason'd about the *Phænomena* which they saw, rather like servile Operators, than great minded *Philosophizers*.

The Essences of *Paracelsus*, the *Archæus*, *Gas*, *Blas*, &c. of *Van Helmont*, notwithstanding all their Boasts, give us as little Light into the Nature of Things, as the occult Qualities of *Aristotle*, and in Spight of their barbarous *Cant*, which, as a *Veil*, they would throw over their Ignorance, and their affected Mysteries, by which they would pass for profoundly Knowing and Reserv'd. We may see their real Defects, and that they grop'd about as much in the Dark, as others whom they superciliously overlook'd.

The *Salt*, *Sulphur*, and *Mercury*, of some, and the five Principles of others, which are the same with the former, with the Addition of *Phlegm* and *Caput mortuum* only, by themselves confess'd to be unactive, are too narrow a Bottom to build a solid and substantial Philosophy upon, as the Honourable Mr. *Boyle* has sufficiently demonstrated: Much less then are we to hope for universal Solutions of *Problems* of this Nature, from those that abridge them yet farther, and resolve all into *Acid* and *Alkali*. The wretched Shift which these *Pyrotechnites* make, and the hasty Conclusions they draw from a few ill understood Experiments, are sufficient to give a Man a Surfeit of such awkward Philosophy. But were these Men qualified with sufficient Learning, and a liberal Education, yet were it impossible for them, upon their Principles, to arrive at any considerable Degree of natural Knowledge, or to know any Thing more than their Eyes would inform them of, without any Use of Brains.

For taking their Principles in the largest Extent, including their *Spirit* or *Mercury*, *Salt*, *Sulphur*, *Water* and *Earth*, as they call their *Phlegm* and *Caput mortuum*, it is impossible for any Man to make any Progress in real Knowledge upon them: Nor is the Multitude of *Phænomena* which the *Laboratories* of such Men produce, any Argument against what is here advanced, nor any Proof of their Skill, any more than a blind Man's throwing Stones, and hitting several People in a Crowd, is an Argument of the Exactness of his Aim. They have indeed named several Sorts of Bodies, which they would have not only to be *generical*, but the *real* and *universal* Materials of all other Bodies. If they were so, Would the Certainty of that inform us how, and in what Manner and Proportion they were mix'd, and acted upon one another, so as to produce the vast Variety of *Beings*, *Animate* and *Inanimate*, and their several Properties which offer themselves to our Consideration? No; they are so far from that, that those Bodies which they call *Principles*, and which, to deserve that Name, should be the most *simple* in *Nature*, are so variously compounded, even to *Indefinity*, that they who use the Terms in *common*, have not one *common* Meaning, but are forced, when they talk and write to one another of those Matters, to allow a vast Latitude of Construction; and perhaps it is not once in ten times, when they discourse of their Principles, especially if they apply them to the Solutions of particular *Phænomena*, that the *Speaker* and the *Hearer* understand their Terms strictly alike, how much soever they may seem agreed.

For Example: The *Chymists* agree in making *Sulphur* the Ground and Cause of *Smell* and *Colour*, a Notion founded upon a slight Experience, that some *Vegetable*, or as they call them, *Essential Oils*, carry the *Smell*, and will sometimes, upon Mixture with other Things, impart the Colour likewise of the Plant or Flower from which they were drawn; yet they have never been able to settle their *Idea* of *Sulphur*, or to come to any generally allow'd Determination, what Bodies they comprehend under that Name, and what they exclude, so that they have assign'd Properties and Functions to they don't know what.

However, upon this, and other Terms altogether as equivocal and uncertain, they found all their *Theory*, which is in all their Writings arbitrary and precarious. Ask any of these Philosophers by Fire to account for the Colour and Smell of a *Rose*, he will tell you, that they spring from the *Sulphur*; and ask him, why sometimes the *Smell* is more vigorous or languid than at others, and he will answer, that it comes from the Exaltation or Depression of the *Sulphur*: But ask him, what *Sulphur* in general is, and you shall either have no Answer at all to it, or that it is an *unctuous inflammable Substance*, by which Answer you are never the nearer the End of your Question: For if you demand further, how *Unctuousity* and *Inflammability* contribute to the Production of Colour or Odour, he is at the End of his Line, and you must rest contented with his Word that they do, without any further Inquiry into the *Modus*. If at any Time you produce them any very high coloured or odorous Body, which, by all the Torture of their Art, will not afford any unctuous inflammable Substance, they will however positively tell you, that it is there conceal'd in the *Concrete*, tho' they are not able to extract it, and rather blame and condemn their Art, than their own Reasoning. Neither will they allow it to be any Argument against them, that a great Number of Bodies, which have the Characteristick Mark of *Sulphur* in the highest Degree, have very little Colour, and no Scent, as Oil of *Olives*, and Abundance of others, which are *transparent*, and pretty near limpid, and will burn till they are quite consum'd, without affording any considerable *Smell*. Even that particular Body from which they denominate this pretended Principle, is not it self an *unctuous Substance*, nor does it upon the *Analysis* yield any. That which the *Chymists* call Oil of *Sulphur*, is an *acid Liquor*, neither *unctuous* nor *inflammable*; so arbitrary and unaccurate are they in their Terms. Besides this, there are Multitudes of other *Concretes*, which they call *sulphureous*, that do not answer both their *Tests*, and many neither of them, which it would be endless, and besides our Purpose, to name.

We have not chosen out this, as more liable to Exception than the rest; any of

those which they call the *Active Principles*, would have afforded us as ample a Field: For there is not one of them under which they do not comprehend a Thousand Bodies of different Natures, of which many are absolutely repugnant to, and destructive of, one another, as manifestly appears from the Mixture of different *Salts*, in which both *Acids* and *Alkali's* lose their separate Properties, and are confounded in a Substance which they have been pleas'd to call *Neuter*, for Want of Skill to range and class them; tho' Abundance of that Kind be of Nature's own Production, as *Sal Armoniack*, which is both *natural* and *artificial*. The same may be said of their *Mercury* or *Spirit*, by which they understand every Thing that is *volatile*, how contrary soever to one another the several *Species* may be; as Spirit of *Hartsborn* and *Nitre*, and innumerable others, which mix'd together, produce the most violent Effervescencies that we know, and in the End destroy the distinguishing Properties of one another.

Notwithstanding this Narrowness of the *Chymical Principles* in their largest Extent, there have some arisen who would yet reduce them to straighter Limits, and solve all *Phenomena* by *Acids* and *Alkali's*, under which they pretend to class all Bodies whatsoever, *Mineral*, *Vegetable*, or *Animal*. This *Hypothesis* has all the Imperfections of the former, and Thousands more. But not to give our selves much Trouble about it, it has one *fundamental Flaw*, which, like a Constitution, Distemper will not suffer it to be long liv'd, which is, that what *Acid* is, or what *Alkali*, none of its Favourers have ever yet been strictly able to define, but have been forced to shuffle the same Body from one Class to another, as Occasion required. Thus *Vinegar*, when pour'd upon any *testaceous Body*, is reckon'd by them an *Acid*, because it raises an Effervescence; but when Oil of *Vitriol* is pour'd upon it, and an insufferable Heat is thereby produced, it is (according to them) an *Alkali*, to preserve their *Hypothesis*, which supposes a Necessity of an *Acid* and *Alkali* in all *Fermentations*.

This *Hypothesis* is the Product of the Laboratory, and calculated for this one *Phenomenon* of *Fermentation* only; and as it is the Offspring of weak unskilful Parents, so is it

it infirm and insufficient for that single End, of which its *Favourers* have been made so often sensible, that many of them, when they are press'd to define what they mean by the Terms, say, that an *Acid* is that which will ferment with an *Alkali*, and an *Alkali* that which will ferment with an *Acid*. Those that have had the Address to avoid being so far press'd, are however as arbitrary in their Accounts, and call this an *Acid*, and that an *Alkali*, just as the Occasion requires, without assigning any Reason why they range them under those Heads, but that, in their Opinion, they must be both there, otherwise there could be no *Fermentation*; and he that will be so gracious as to allow that, may, in many Cases, make which he pleases the *Acid* or the *Alkali*, without any Opposition from them.

It had scarce been worth while to have taken so much Notice of these absurd Opinions, had they not crept so far into Physick, as to pervert the Understandings, and debauch the Reasonings, of many, who otherwise might have employ'd their Talents to good Purpose, and given Opportunity to impudent *Quacks* and *Empiricks* to prate about Things they did not understand, and banter the People with *Cant* without Reason. There is no Doubt but *Chymistry* affords very great Additions to, and Improvements of, the Art of Healing, and the Theory of Physick, and that those who are ingeniously and honestly conversant in the *Laboratory*, have Opportunities of making many luciferous Observations, when their Thoughts are not cramp'd and confin'd to the Furnace, which has sent into the World so many scandalous *Empiricks*, who, trusting to a few prestigious Tricks which that has taught them, have impos'd upon the less considering Part of Mankind, who easily believing that they who could do Things to them so surprizing, were Masters of all the Secrets they boasted of, have to their Peril confided in them upon such Reasonings; tho' they might as well have attempted to account for all the Motions of a Clock by *Acid* and *Alkali*, or *Salt*, *Sulphur* and *Mercury*, as what they pretended to.

The Founders of the Chymical Philosophy were certainly very unwary in circumscribing themselves to such narrow Principles. For any Reason that appears to the contrary,

they might have allow'd themselves Five hundred, as well as Five, by which Means they would have avoided those miserable Shifts they have been put to, to save the Appearance of their Principles; nor need they have rank'd Bodies directly opposite and destructive of one another under the same Class, as they are frequently forced to do. When we consider what a Variety of *Hypothetical Principles* there are, which their Simplicity, as to Sense and our *Analysis*, may make warrantably pass for *Second* or *Subaltern Principles*, higher than which a *Chymist* cannot mount, because his *Laboratory* cannot inform him farther, it is a Matter of just Wonder, why they should restrain themselves, when they might have taken a warrantable Liberty, and been justified by the Productions of their Furnaces. They could not but know, that many of those Bodies which they call *Mercury* or *Spirit*, were as essentially distinguish'd from one another, and by as indelible Characters, as *Sulphur* is from *Salt*, or *Salt* from *Mercury*, and so on. Had they but enlarg'd the Number of their Principles, and not required them all, or any stated Number of 'em in every Body, they had taken away from their Opposers innumerable Occasions of Triumph, which upon the present Foot are unavoidable.

That Principle alone, which they call *Mercury* or *Spirit*, includes divers Species of Bodies, which nothing but the arbitrary Humour of such *Chymists* could reconcile to one Head. The volatile acid and alkalious Spirits are not only different, but opposite: The vinous inflammable Spirit is specifically different from either of them; and there is another vegetable Spirit, which has not yet receiv'd a classick Name, that differs as much from them all, and is neither manifestly acid, alkalious, vinous, nor inflammable, and yet is a very brisk active Spirit, will ferment very durably with Spirit of Nitre, yet not so much as turn the Colour of Syrup of Violets either Way; I mean, that Sort of Spirit which is drawn from *Scurvy-grass*, *Horseradish*, and all that Tribe of biting Plants: And there may be a great many more as specifically distinct, if their Properties were nicely enquired into, which this inaccurate Way of Classing has confounded in the general Mass. Even among the very manifest

Acids themselves, and the strongest of them, we find very considerable Differences, which seem not to be owing to their Acidity, but to some other Qualities, yet no otherwise discover'd, than by the Properties which flow from them. Thus *Aqua fortis* will dissolve *Silver*, and not *Gold*; and *Aqua regia* will dissolve *Gold*, yet not touch *Silver*; and Oil of *Vitriol*, which seems to be as high an *Acid* as either of them, will not act upon either, but will dissolve *Iron* more readily than they. This evidently shews, that those Qualities which the Chymists ordinarily assign as the Distinguishing and Characteristick Marks, do not sufficiently discover their Properties and natural Relations to one another, and that consequently a more accurate Division is necessary to make them so useful as the Chymists would pretend, and (without vain Exaggeration) they might really be, if consider'd as they ought.

The same may be said of their *Salts*, under which Head they class all Sorts of Bodies that are *sapid* and *solable* in *Water*, whatsoever Contrariety or Repugnancy they may have to one another in their own Natures. These perhaps are the most reasonably class'd of all their pretended Principles, notwithstanding the Variety and Difference that is to be found among them; because they answer the generical Trial, and last more uniformly than the rest of their *Active Principles*. But when they come to make it a Principle or Producer of many of those Qualities which they pretend to fetch from it, they argue as absurdly as from any other Part of their *Philosophical Romance*.

Their other two, *Phlegm*, and *Caput mortuum*, which are by all of them reckon'd as inactive, and therefore by many thrown out of the List of *Principles*, are liable to as many Exceptions, in Proportion to the Use they make of them. But it is not proper to spin out this Digression any farther. They that believe what we have already said against their *Principles* to be reasonable, will be satisfied with that: They that do not, will require more Conviction than my Design gives me Room for here, and must have Recourse to those Authors that treat exactly on this Subject, and will undoubtedly, if they be unprejudiced, find it in that elabo-

rate Piece of the Learned and Ingenious Mr. Boyle, call'd the *Sceptical Chymist*.

That the Resolution of Bodies into their visible Elements, or the most simple Parts that hitherto Art has suggested any Way to find, is of great Use to Physicians, is past Controversy, as well from the constant Use which Physicians, both in their *Theory* and *Practice*, make of such Bodies, as from the Necessity they have of Recourse to such Things as they can upon Occasion produce and apply, with some Knowledge of their Operations and Effects: For tho' those Bodies be not so absolutely simple, as in *Natural Philosophy* to deserve the Name of *first Principles*, yet since they have such constant and regular Effects, as we are not able to prevent, without first corrupting them, and are the ultimate Results of the minutest Analysis we have been hitherto able to make, they may very well be reason'd upon as *subaltern* or *second Principles*, which are the Instruments that Physicians must use, who are not able to govern Matter and Form, or Matter and Motion, abstractedly consider'd, which, tho' they may afford pleasing Speculations, and perhaps true ones too, are not reducible to *Practice* and *Experiment*; and therefore of no real Benefit to Mankind, without the Intervention of some such intermediate *Principles* as these.

It would therefore be a very great Service to all Sorts of *Mechanical Operations*, to redeem these *second Principles* from that Obscurity and Perplexity into which the *Chymical Philosophers* have, either thro' Want of Judgment, or Ingenuity, plung'd them; and perhaps by classing these Bodies, in Appearance simple, in a clear Method, according to their several distinguishing Qualities and Effects, many Doubts, now very perplexing, might be resolv'd, and many Ends answer'd, which now remain as *Desiderata*, as well in all other Arts, as in Medicine, which (we hope) will be sufficient to induce those who have Means and Capacity, to contribute their Endeavours to so necessary a Work, for the Relief of Humane Infirmities, in which they will have the Advantage to find the Field more pre-occupied than in any other Part of Natural Knowledge, and Room enough for the Industry and Improvements of Ages yet to come.

But

But to return to our immediate Subject, *Fermentation*, which is, notwithstanding the Endeavours of Some to fling it out, one of the main Wheels of *Animal Oeconomy*; we have endeavour'd to shew, that the *Corpuscularian Hypothesis* is too general, and abstracted to account satisfactorily for the *Phænomena* of particular *Fermentations*. However true it may be, that what is laid down in it is the Ground-Work of all, and is no better a Direction in Practice, than it would be to a Traveller, to tell him that *Lyons* was a City in *France*; if he that was to go thither, had no better Means of inquiring his Way, 'tis probable he would never get thither. *Chymistry*, like a particular Map, seems to promise a more certain Direction in some Parts of Physical Knowledge. But as it has been manag'd, like an ill Map, it points us only to some few conspicuous Parts, without any measur'd Distances or Degrees of *Longitude* and *Latitude* to guide us certainly in our Way, and leaves us to hunt out the Place we would arrive at, whether to stumble fortuitously upon it, or by immethodical Inquiries of I don't know whom, or how to find it out.

We are indeed oblig'd to those ingenuous Operators in *Chymistry*, who, without Bantering us with false Reasonings, communicate to us what their Labours and Inquiries have made certain to them, and like those honest Country Men, who, without *Clock*, *Watch* or *Dyal*, look up to the Sun, and tell us, as nearly as they can guess, sincerely what Time of Day it is, which, though we cannot depend upon to a Minute, will however serve us to proportion our Speed by, if we know the Length of the Way. To the Hints which such *Chymists* afford, we owe all the Improvements that have been made in the *Theory* of *Animal Fluids*, and though they are not often to be met with, one good *Chymist* makes Preparation for two *Charlatans*, with all their vain affected Mysteries and Mischievous *Arcana's*.

Having premis'd thus much concerning *Fermentation*, in order to remove such Prejudices as have been entertain'd concerning it, and shew the Necessity of a more particular and less exceptionable *Rationale* of this surprising Method, by which Nature works in the Production of most of her considerable

Animal and Vegetable Phænomena, it will be necessary to offer something farther. And here it will not be improper to remind the candid Reader, that as we have no where denied the Existence of the *Æther* of the *Corpuscularians*, nor its Activity in the Productions of this particular great *Phænomenon*, *Fermentation*, but have thought their Solutions too slightly circumstantiated to give any great Satisfaction or Light into a Part of Nature so abstruse, and to clear up all Doubts concerning it; so on the other Hand, we must frankly avow, that many Circumstances of this *Phænomenon* alone, plead strongly for the Existence of some such *subtile* Bodies, which permeate all others with the utmost Degree of Celerity and Rapidity imaginable, otherwise it wou'd be hard to account for that violent Motion, which is instantaneously produc'd between Bodies, that were, to Appearance at least, before at Rest, especially if *Nil dat quod non habet* be in this Case a true Axiom.

The *Chymists* on the other Side exalt, and think the Power and Contrariety of their *Acids* and *Alkalies* sufficiently demonstrated, since, from the Commixture of those opposite Bodies that they range under these Heads, most of those sudden and violent *Effervescences* arise. Neither could this *Fermentative* Opposition be denied to 'em, if they were contented to lay no more upon it than it would fairly bear. But when they pretend their *Tria Prima*, their *Salt*, *Sulphur* and *Mercury*, or even with the other Two, *Water* and *Earth*, added, to be the *Hypothetical Principles* of all Bodies, and the sole efficient Causes of all the Properties and Accidents that belong to or befall them, they give all those that are ingeniously studious of promoting real and true natural Knowledge, just Provocation to refute and expose them. For to adjust all Manner of *Phænomena* to the largest of their *Hypotheses*, we must confound all our *Idea's* of natural Bodies, and range them sometimes under one Principle, sometimes under another directly opposite; as for Example, when the *Spirit* or *Phlegm* of *Viuriol* ferments with Oil or Salt of *Tartar*, or Spirit or Salt of *Hartshorn*, an *Hypothetical Chymist* will roundly call the *Spirit* of *Viuriol* an *Acid*, and the other Bodies *Alkalies*. But what, will he call the same *Spirit* of

Vitriol when it ferments with Oil of *Vitriol*, another *Acid*, and not only so, but drawn from the same Body by the same Operation, without any different Circumstance necessary to produce it, but a little more Time and Fire? The same may be said of all their very high *Acids*, which will ferment with a lower Class, tho' they differ, only *secundum Magis & Minus*, no more than in Degree.

Since therefore *Fermentations*, and those not a few, may be rais'd without the necessary Colluctation of an *Acid* and an *Alkali*, an ingenuous *Chymist* would lay them aside, as no true Principles of *Fermentation*, and consider them only as *Instruments*, which, whenever certainly both present, highly promoted that Operation, in which all rational Inquiries must go along with him, or reject indubitable Fact. But then he must go out of the Sphere of his own Activity, his Laboratory, for it, to which the working *Chymists* have been generally so bigotted, that they have commonly neglected all that was to be learn'd without the Furnace, as not conducing to their End, and too ignoble for their Ambition or Avarice.

But whether *Chymists* will be so condescending or not, the *Corpuscularian Principles* are not so strait laced, but that they may to very good Use receive the *Chymical Acid* and *Alkali*, so as not to make them *Hypostatical*, or the sole constituent Parts of all Bodies, and employ them with good Success in the Solution of many natural *Phænomena*, concerning which they have been used to reason too abstractedly and remotely to draw any very useful practical Inferences from. Thus tho' a *Corpuscularian* sees a violent *Fermentation* rais'd between two Bodies, and imputes it to some Obstruction thereby created to his permeating *Æther*, yet he is at a Loss for the Reason of this Obstruction, and why rather between the two Bodies before him, than some others, that seem more likely to produce it.

The *Hypostatical Chymist*, who from Experience knows, that those Bodies do constantly and regularly exhibit those Appearances, is as much at a Loss why; but without assigning any Thing mechanically capable of exciting such Motions, absurdly feigns natural *Inclinations* and *Aversions* in inanimate Bodies. But the *Corpuscularian Chymist*, who

applies the *Mechanical Principles* to the *Phænomena* of the Laboratory, avoids both these Difficulties, as well immediate and particular, as remote and general, as Mr. Boyle has very happily experienc'd, particularly on this Subject of *Fermentation*, by supposing the *Acid* to be sharp or pointed Bodies, like little Blades of Knives, and the *Alkalious* to be porous, like small Sheaths, into which the *Acids* are forcibly driven by the rapid Stream of *Æther* constantly pervading both Bodies, tho' not in equal Measure, but in Proportion to their Number and Capacity of their respective Pores, which Agitation causes first a very furious Ebullition, till the Pores of the Mix'd are dispos'd regularly for the Passage of the *Æther*, and next a *Precipitation* or Subsidence of those Parts, which being engaged mutually, or impacted into each other, grow superficially heavier than the Fluids which before sustain'd them; and therefore, after their *Coalition*, or as the *Chymists* term it, *Coagulation*, sink down, and leave a free Passage to the *Æther* thro' the mix'd Liquor, which thenceforward remains to outward Appearance one uniform homogeneous Fluid, where the *Coagulation* does not unite the whole Substance; or otherwise, the Parts of either Body are so minutely broken or mix'd, as to swim quietly together under one Form, without *Precipitation*, and are to Appearance uniform, though not simple.

But this Way of Solution by a mix'd *Chymico-Corpuscularian Hypothesis*, however ingenious and rational, tho' it seems justly to take Place in those hasty *Fermentations* which are produced by the Mixture of manifest *Acids* and *Alkali's*, leave us yet some Room to doubt its Sufficiency; when applied to other Kinds of *Fermentation*, where the Concurrence of an *Acid* and *Alkali* are not so evident. For tho' the Violence of the Motion, and the Suddenness of the Expansion, in such *Fermentations* as we have been just now treating of, seem to require the Activity of the *Æther*, or some other Body of equally rapid Motion, and general Influence, which will as little fall under the Examination of our Senses, to give Life to the *Acid* and *Alkali*, or other Principles of the *Chymists*, which, whatever they dream of, or feign of their Activity, are of themselves as

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sluggish and inactive as those they call so ; and even their most visibly active Principle, Salt, is perfectly dead, unless invigorated and enliven'd by Solution in some of that *Phlegm* which they so much despise : Yet there are some *Fermentations*, to which it cannot be prov'd that both these *Chymical Principles* concur, and some to which perhaps neither of them do, and whose leisurely, unprovok'd, gentle Intumescence and Despumation seems not to need, much less to have, any such violent forcible Agitation, as the Interruption of the Course of the *Aether* is presum'd to be attended with. Of this leisurely gentle Kind, are all those which Nature uses towards the Perfection of those Purposes wherein she uses this Way of Operation, as in the Maturation of *Fruits*, and pure *natural Liquors*, made of their unmix'd Juices, &c. which I shall therefore call *Natural Fermentations*, according to a Distinction already laid down ; and those that shall proceed in a Manner analogous to these, *Sponaneous*, altho' they may happen to have been first produced, or afterwards produced by Art, unless it be by the manifest Colluctance of *Acids* and *Alkali's*, all which we shall call *Artificial* or *Violent*, and have already accounted for in general, by the *Chymico-Corpuscularian Hypothesis* of that Noble Philosopher Mr. Boyle, to whom all the Curious are eternally indebted.

Under the Artificial or Violent *Fermentations*, may be comprehended all those that spring from the mutual Action of a manifest *Acid* and *Alkali*, and some others which we range with them, because of the Share which high *Acids* have in such *Fermentations*, and that they are accountable for by the same *Hypothesis* ; such are the *Ebullitions* rais'd in the Dissolutions of *Gold*, *Silver*, *Copper*, *Iron*, *Lead*, *Quicksilver*, *Coral*, *Pearl*, &c. in *Aqua regia*, *Aqua fortis*, *Spirit of Nitre*, *Oil of Vitriol*, *Spirit of Salt*, *Tartar*, *Allum*, *Juice of Lemons*, *Vinegar*, &c. the former of which metallick and natural Bodies, tho' the *Chymists* arbitrarily rank them among the *Alkali's*, only because they ferment with, and are dissolv'd by, *Acids* ; yet they proceed therein very precariously, and without Authority, since all their Skill in *Analysis* could never fetch any Thing directly *alkalious* out of 'em. With more Justice might they have reckon'd

Nitre, *Vitriol*, &c. among the *Alkali's* ; for these will not only ferment with each other, but with their own *acid Liquors*, and over and above, upon Incineration, afford a true *lixivial fix'd Salt* ; yet these were never accounted *Alkali's* by them, perhaps upon the Score of their yielding such an Over-balance of *Acid* on the *Analysis*.

Whether it may be altogether so reasonable to exclude those *Inflammatory Effervescencies*, which arise from the pouring a highly rectified *Acid* upon the volatile distilled or essential Oils of Vegetables, from the Number of those caus'd by *Acid* and *Alkali*, is somewhat more a Question : For tho' these be what they call the *Sulphurs* of those Bodies, and that *Sulphur* taken strictly to their Meaning, be neither *Acid* nor *Alkali*, as being a Principle, and as such independant of *Acid* and *Alkali*, which are only two Classes of another Principle, viz. Salt ; yet the *Chymists*, pretending that none of their Principles are to be extracted pure, especially *Sulphur*, may alledge, as they really do, that these *Sulphurs* are highly charg'd with the volatile essential Salts of the Vegetables, which they may say is *alkalious* ; and that tho' the actual Inflammation, which ensues upon some such Mixtures, proceeds from the *Sulphur*, which is their inflammable Principle, the Effervescence is owing wholly to the Contrariety of the Salts of the two Liquors. But this is saying without proving, according to their usual arbitrary and unaccurate Way : And therefore, till they plainly demonstrate the volatile Salts of Plants to be *alkalious*, and to have such an Antipathy to *Acids*, it will be safer to acquiesce in the general Solution, that the Parts of the *Acid* insinuating themselves in great Plenty into the Pores of the Oil, the Passage of the *Aether* was so interrupted, as to occasion an Explosion so violent to dislodge them, as was sufficient to produce an actual Flame, which catching hold of the Oil, its most ordinary *Pabulum*, it continued till all the Oil was consumed, but without any further Ebullition or Explosion ; the Passage being clear'd at once. They that consider how little Countenance the Spirit of *Scurvy-grass* gives to the *Alkaliousness* of volatile vegetable Salts, will be apt to require more Proof than a vulgar *Chymist's* bare Word.

For besides the *Phænomena* I have already mention'd from that Spirit mix'd with strong Spirit of *Nitre*, it continued to send up numerous Bubbles, as often as I pull'd out the Cork, for some Days, and retain'd both Smell and Taste entire, tho' somewhat overpower'd by those of the *Nitre*, yet very plainly to be discern'd thro' the other. The same Thing it did, but more vigorously and plainly, mix'd severally with *Vinegar*, Juice of *Lemon*, but without any Effervescence, Heat or Ebullition, and was tasted as fresh in 'em, tho' mix'd with a much larger Quantity, as Sugar could have been, the Smell in the mean time overpowering those of the *Vinegar* or *Lemon Juice*, without destroying or dainping either of them; so that the putting 'em together, seem'd to have no other Effect than that of simple Mixture. These, and divers other Trials, as well with *Alkali's* as *Acids*, convinc'd me, that it belong'd to neither of those Classes, since it neither destroyed, nor was destroy'd by any of them: Therefore, till I can be convinced what those Salts are which are suppos'd to float in vegetable essential *Oils*, and what Share they have in these extraordinary Fermentations, I shall content my self with the foregoing Solution, and range them among the *Anomalous Fermentations* of the *Chymico-Corpuscularian Hypothesis*.

There are other *Anomalous Fermentations*, which are excited by the pouring of corrosive acid Liquors upon divers Bodies of very distinct Kinds, which might be accounted for by the foregoing *Hypothesis*; such as those between Oil of *Vitriol*, Spirit of *Nitre*, *Aqua fortis*, &c. and Simple Water, Spirit of Wine, Spirit of *Scurvy-grass*, &c. of which it is sufficient to my present Purpose barely to have made Mention: For not designing a compleat History and Theory of Fermentation at large, but such a restrain'd one only as should have Regard to the Theory of Animal Oeconomy, we shall be particular only upon those Kinds, which either have been already used to illustrate and explain some Parts of the Animal Oeconomy, or hereafter probably may be put to that Use by others. Having therefore spoken of the principal Fermentations rais'd by high corrosive *Acids*, which I have call'd Artificial or Violent, because the main Instrument that produces them is pro-

cured by great Art and Violence of Fire, we pass over the rest, in Hopes, that if what in the Course of this Work we shall have to say against such Sort of Illustrations, be of any Weight, we shall not for the future be troubled with any precarious Theories, as will stand in Need of such fallacious Supports.

We come now to those gentle Kinds of Fermentation, which we have ventured to call Natural or Spontaneous, not but that we know even these are sometimes procured, and often promoted, by Humane Skill and Industry; but because they work in such a Manner as Nature her self does in many of her Productions, and are urg'd on by such Means as are of her furnishing, or so much resemble those, that they seem as it were of her prescribing.

Leaving here the Laboratory, and all its pompous Apparatus, we must return into that of Nature, where every Thing is perform'd by a Method and Instruments more simple, and by a Mechanism therefore as much more wonderful, as its Effects surpass in Beauty, Variety and Use, those of Humane Art. Into this Field likewise the *Chymists* have attempted to thrust their Sickle, and to limit the Operations of Nature to the narrow Principles of their Art, and to account for all the visible *Phænomena* of the three Kingdoms, into which (according to their Jargon) they divide the Terraqueous Globe by their *Tria Prima* or Five Principles, dividing as arbitrarily among them the several Effects of Nature, as if they had been the Authors, but with as little Judgment as if they were not rational Contemplators.

In the Sort of Fermentations we are now to speak of, Air is the principal Instrument, the first Mover; in these, neither the Chymical Principles, nor their Acid and Alkali, have any Thing to do: For tho' in many of the Bodies fermented this Way, some of their Principles, and sometimes all, may upon Analysis be found, yet it is pretty plain, that neither they, nor their Acid and Alkali as such, contribute any Way to the *Phænomena* produced. We shall not pretend to determine, what Share the *Aether* or *Materia subtilis* of the *Corpuscularians* or *Cartesians* may have; because we do not know how far that may enter the Composition of that

aggregate *Fluid*, which we call *Air*: But we may be apt to think, it has not much to do in this Sort of *Fermentations*, otherwise than as it makes a Part of the Compound. *Air*, of how many soever different Sorts of Particles or Atoms it may consist, is agreed to be a *springy elastick Body*, compressible it self, and able by its Weight to compress others, which are the only Qualities necessary to the present Purpose.

It is farther found by Experience, that all sorts of Bodies, whether *fluid* or *solid*, that are not too hard to yield to such Tryals as the Curious have been hitherto able to make, contain in them a greater or less Proportion of included *Air*. The *Torricellian Experiments*, and Mr. Boyle's *Air-Pump*, yet more amply and sufficiently have demonstrated, that even the most *dense* of *Fluids* contain a considerable Quantity of it, and that some Bodies reckon'd among the *Solids*, are not destitute of it. Though in these latter the Proportion is not so easily found, because these Bodies do not so readily yield to Compression or Elasticity, yet that many of these do include no small Quantity, the Dissolution of *Bones*, made in Mr. Papin's *Digestor*, affords us reasonable Grounds to believe; tho' the Materials of which that Engine must necessarily be made, not being Diaphanous, we cannot observe the Gradations or Steps made towards that Solution.

Divers Naturalists have offer'd curious Speculations concerning the Vegetation of *Plants*. Some have employed themselves about the Material Principle from which they receiv'd their Augmentation: Others about the Vessels through which it was convey'd, and the Means by which it was rais'd; Speculations which we have nothing to do withal here, any more than to enquire, whether the different *Species* spring from *Seminal Principles* really and unalterably differing, or from the same Matter variously modified by several and peculiar Organs. All that shall be offer'd in this Case is, That we suppose that their various Degrees of *Vegetation* depend upon the different Degrees of Expansion or Rarefaction of the *Air* contain'd in their several Juices, which will be greater or less, as external Circumstances and the Texture of the Vessels of the several *Plants* themselves concur to affect or admit

it. Thus we see the same *Species* of *Plants* promoted or retarded in their Growth, even in the same soil, by the Encrease or Decrease of Heat, whether *Artificial* or *Natural*.

In these *Fermentations* of *Liquors*, which are partly *Natural*, partly *Artificial*, those are observed to be forwardest which are most impregnated with *Air*, as we find in *Must*, *new Malt Liquors*, &c. It has been found in Mr. Boyle's Engine, that those *Liquors* which are specifically lightest, abound with most *Air*, as appears by the different Degrees of *Bubbling* and *Intumescence* upon the Exsuction of the *Air*. This to me appears to proceed from no other Cause, than that, by taking off the incumbent Weight, Opportunity is given to the included *Air* to dilate and expand it self: For tho' some *Liquors* will in that Engine bubble more than others that swell more in Bulk, and are specifically lighter, yet this seems to depend not only upon the Quantity of the *Air* included, but upon the *viscosity* of the *Liquor* it self, whose Surface will not so easily break without first rising as it were in *Blisters*.

The common Experiment which Boys make of blowing *Bubbles*, evinces this pretty plainly; for tho' in simple Water it will not succeed, yet if a little Soap be incorporated with it, it will bear being blown up to a very great Degree, so as to be let fly from a Pipe in pretty large Bladders, and so float for a considerable Time in the open *Air*, and last more or less Time, according as the Body of the Water, which makes the Shell of the Bubble, is more or less extended at its first parting from the Pipe. So in the Engine, *Oil of Olives* affords more, larger, and more lasting Bubbles, than Water, which are owing to the lightness arising from the Quantity of *Air*, and the Senacity of the *Liquor*. *Spirit of Wine* yields more numerous, but less lasting, Bubbles, and swells higher than Water; and *Oil of Tartar per Deliquium* affords very few, and no Intumescence. These Experiments compar'd, shew, that the *Specifick Gravity* of *Fluids* depends upon the Quantity of *Air* they include, and that the Largeness and Duration of the *Bubbles* is owing to the Consistence of the *Fluid* through which the *Air* that composes them makes its Way. Let it be no Objection hereafter, when we come to apply this Do-

Strine to *Animal Fluids*, that all these Experiments we instance in here, are made upon the Product of *Vegetables*; for the same Trials have been made upon *Animal Liquors*, which answer equally according to their *Specifick Gravity* and *Tenacity*, tho' it be not proper in this Place to recite them.

It has been a general Observation, and is in the main true, tho' it does not always prove so, that the more mix'd and compounded a Liquor is, the more ready it is to ferment. Of this Observation the *Pyrosophists* have made great Advantages, pretending, that all the Tumult and Bustle that is observable in those Liquors, arises from the Jarring and Disagreement of their Principles. This (in my Mind) makes rather against, than for, their Philosophy; for if their Principles, whether they make *Two*, *Three*, or *Five*, must needs be the *Elements* or *Hypo-statics* of all Bodies, it seems more natural, that they should readily close and cement, than by such a Disagreement break that Union, and discompose that Body, in which at last they must coalesce. But as indeed they have never brought any satisfactory Proof, that all Bodies must be compounded of their Principles; so neither does it appear, that this Tumult in mix'd Bodies arises from them; and therefore this Observation makes neither for or against them, saving that it shews them arbitrary and unaccurate in their Accounts. But *heterogeneous* Liquors, containing Parts diversly figured, do not subside so close as the more *homogeneous*, whose Parts, from the Congruity of Figure, ranging close together, admit of less *Air* in their *Interstices*, and consequently are less obnoxious to a tumultuous Rarefaction, which is what is call'd *Fermentation*.

For as Mixtures may be made of a great Number of *Fluids*, without any subsequent or lasting *Fermentation*, as of *Water*, *Wine*, *Sugar*, and *Juice of Lemons*, &c. so there are some other, which, after having become as to Sense *homogeneous*, are upon every slight Occasion, as a little Motion, or standing warm, prone to effervesce very strongly, as *Diacodium* will do, that seems as little or less compounded than many that will not do it so readily, nor to that Degree; which plainly shews, that it is not bare Mixture, but an internal Disposition in some *Fluids* greater

than in others, that occasions the different Degrees of *Fermentation* under the same external Circumstances.

The express'd Juice of *Grapes*, which is call'd *Must*, is a Liquor that abounds with *Air*, as its *Specifick Gravity* shews; and therefore readily ferments, and flings up to the Surface a Sort of Scum abounding with *Air*, which is call'd the *Flowers*, and consists only of some of the more *viscous Parts* mix'd with some of that *Air*, which has made its Escape thro' the thinner Part of the Liquor, as appears by the Texture of it, which is only a Heap of little Bladders fill'd with *Air*, which, during the Time of *Fermentation*, heaves and swells it into many *Blisfers* on the Surface, which last like the Bubbles which Boys blow, till that viscous *Cortex* is extended beyond the Cohesion of its Parts, and then break. The same happens to *Malt Liquors*, and others compounded of light and viscous Bodies, the *Flowers* of all which consist of Particles in that Respect resembling each other, and which, if cut through when dry, or near it, shew a spongy Texture, abounding with little Cells of included *Air*. This *Yeast* or *Flowers* of *Wine* or *Beer*, if put to Liquors that ferment but sluggishly, will, as common Experience shews, make them work very briskly.

The *Chymists* may perhaps pretend, that it is the *Acid* in *Fluore*, with which these *Flowers* abound, that occasions this *Fermentation*. But then there will be two Difficulties for them to answer: First, Where is the *Alkali* upon which those *Acids* should operate as such? For none of these Liquors afford any, but from the *Incineration* of their *Lees* or *Tartar*, to produce which, or at least to disengage them from the Bodies to which before they were strictly united, Violence of Fire is required; and that if before really existent, was so implicated in other Bodies, as not to contribute any Thing to the Operation they would lay at its Door. And next, Why those *Flowers* of *Wine* or *Beer*, which (after keeping) will grow very sower, but will subside, and let out a great deal of the *Air* they before contain'd, should not operate more briskly in this State than in the former, which, if their Activity lay in the *Acid*, they must necessarily do? But Experience demonstrates just the contrary, and

and shews, that they may be kept till they are very fowr, and absolutely unfit for forcing *Fermentation*.

They that attribute the *Fermentations* of Wine, and other Liquors of that Sort, to the Activity of the *volatile vinous Spirit*, and would have that put the rest in Motion, have at least more Shew of Reason on their Side: For it is evident from Fact, that this *Yeast* or *Flower of Wine* or *Beer*, affords in Proportion more *inflamable Spirit* than the Liquor it self after this Purgation. But then why should not this *Spirit*, when extracted and defecated by Distillation, act more vigorously, and ferment the Liquor more violently? On the contrary, it will not in the least move it. Among all the Experiments of *Artificial Fermentation*, there is not one that countenances the Notion of its proceeding from an *Acid*, except the salting of *Leven* only; which those that would derive all Sorts of *Fermentations* from *Acid* and *Alkali*, pretend to be done in order to impart an *Acid*, and so exalt the *Ferment*; whereas they mistake the Meaning of those that do it, which is only to preserve it from growing musty and stinking.

All the rest shew plainly, that their Action depends neither upon *Acid* or *Spirit*, nor in some can the most bigotted *Chymist* discover any of these. When some Wines, whose Colour is not inconvenient for such a Method, ferment sluggishly, or want to be re-fermented, the skilful *Wine-Coopers* use *Whites of Eggs*, whip'd up with a *Whisk*, so as to be very light and spumeſcent, which they stir into their Wines, and so set them again upon the *Fret*.

It can't be pretended, that there is in this Case either *acid* or *vinous Spirit*, or indeed any Thing natural in the *White of Eggs*, except their *Viscosity*, that contributes to their *Activity*. By Means of that indeed, it inviscates, and engages the *Air* upon Conquassation, and thereby becomes capable of being equally mix'd thro' the Body of the Liquor, and consequently of raising such a *Fermentation* as the *Artist* wants, before it can extricate it self: For the *Air* being in this State compress'd, does, by its *Elasticity*, naturally tend to recover its former Degree of Expansion, and not being able to do it all at once, by Means of Explosion, occasions a

continued Series of Successions *quaquaversum* in the Liquor, by which Means ſeveral Concurrences and Combinations of the ſeveral Particles that float in it are occasion'd, whence follows that Subsidence of the heavier which is call'd *Precipitation*, as the Motion it self is *Fermentation*.

But if these, and all other Methods of *Fermentation* hitherto mention'd, might be suspected of some secret latent Quality in the Ingredients used to procure it, there remains yet one in Use among the skilful Brewers of *Wine*, and other Liquors, which is, beyond all Possibility of Exception, exempt from such a Suspicion. This is the Way of doing it by Bellows only, in which they use a large Pair of Bellows, with a Stop-cock upon the Snout, the End of which is thrust thro' a Perforation made on Purpose in the End of the Vessel, from which the Liquor is to be driven thro' the Cock at the other End into another Cask, which, in case of prick'd Wines, is generally furnish'd with a rich spirituous Lee, with which the Wine, by Means of this Impregnation with *Air*, is made to ferment, incorporate, and repurge it self again; and by this Means decaying Wines are frequently restored and made sound, and sometimes better than at first.

In this Case, neither *Acid*, nor *Alkali*, nor *Spirit*, nor any other imaginary Agent, except *Air*, can have any Thing to do; because nothing else is mix'd but Wine, which simply put together, will not succeed so, let them agitate them how they please, unless something be added to them which is incorporated with more *Air* than the Parts of the Wine it self. It is true, that *Vitriol*, *Arsenick*, and some other Bodies not so impregnated with *Air*, will in the high-coloured Wines help to strike the Tincture deeper; but they are so far from forwarding the *Fermentation*, that they check it, and hasten the *Precipitation* of those heavy Parts, which, by an Union with them, are carried down along with them.

It may not be improper here, though not directly to our present Purpose, to take Notice, that Wines thus fined down, as the Vintners call it, may purge themselves entirely from these dangerous Drugs by their absolute Subsidence; yet if the Wines remain never so little upon the *Fret*, it would be very hazardous to drink of them in that

State. The Design of this does not oblige us to go through the *Theory* of fermented Liquors, though there are scarce any of them which may not be accounted for, as demonstratively as Physical Matters will bear, by one or other of the Ways already laid down; especially those which tend to the Perfection or Exaltation of the Liquor, that is, to render it more *spirituous* or manifestly vinous, which is the only *Fermentation* which some

will allow to be a true one. We need not in this Place make any particular Application to Animal *Fermentations*, because that must be done in its proper Place, when we come to speak of the Animal Fluids, call'd *Spirits, Chyle, Lympha, Serum, &c.* In the mean time, we have thought thus much about *Fermentation* in general proper, to prevent a Confusion of *Idea's*, or unnecessary Repetitions.

Dr. John Mayow's Treatise of the Motion of the Animal Spirits, to which some Things are added concerning the Motion of the Brain, &c.

C H A P. I.

The different Opinions of the Authors concerning the Manner of the Contractions of the Muscles are examin'd.

THAT there is a certain nitro-aerious Spirit transfer'd by Means of the Respiration into the sanguineous Mass, unto which its Fermentation and Incalescency owes its Origine, has been shewn by us in another Place: And now I must add, in relation to this same Spirit which is drawn in by Inspiration, that the same bears a considerable, or the greatest, Share in the performing of the Animal Motions, which Opinions, as maintain'd by me before, I continue to assert at this Time also; not because that being devoted to any preconceiv'd *Hypothesis*, I am resolv'd, as it is commonly done, to defend it to the utmost, whatever it be, but because I judge it most consonant to Reason.

The Manner or Method by which Motions are perform'd, is so obscure, that its Disquisition has proved no less troublesome to the modern Anatomists, than in former Ages it did to the ancient Philosophers; just as if Nature did take Delight to expose our humane Frailty or Ignorance, since even those

Things which we feel every Day in our own Hands, and perceive with our own Eyes, seem nevertheless the most remote from our Apprehension and Understanding.

Among these Things, *Motion* challenges most deservedly its Place; for we are so far ignorant as to the Manner of its being perform'd, that scarce believing our own Eyes, its very Existency is sometimes call'd in Question, it being one of the most celebrated Questions in Dispute among the Schools, *Whether there be any such Thing as Motion?* The Sophists were so very positive in former Ages, that there was no such Thing, that its very Existency had been quite denied long before this, had not the Motion it self in its very Action been obliged to stand up in its own Defence, and convinced the Philosopher by the Peripatetick or Circumambulation.

Now when all these Difficulties have been rais'd concerning Motion in general, in how much more Obscurity is the Animal Motion involv'd, where we see very bulky Bodies to produce very stupendious Motions, and
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that of their own Accord, and to our no small Surprize?

'Tis beyond all Dispute, that the Animal Motion is perform'd by the Contraction of the Muscles; but in what Manner this their Contraction is perform'd, is still much controverted by the Authors. The most common received Opinion nevertheless is, That the Fibres of the Muscles are inflated, so that being tumefied or render'd broader in Breadth, they are contracted in Length.

This Inflation of the Fibres is by the most Ingenious Dr. Willis explained in the following Manner, in his Exercitation of *Muscular Motion*, viz.

' That the Animal Spirits being convey'd from the Brain by Means of the Nerves to the Muscles, are stored up in the Tendinous Fibres like as in so many commodious Storehouses; that the Spirits, so soon as the Impulse is given of performing their Function, do make their Sallies out of the Tendinous into the Carneous Fibres, where meeting with some other active Particles of a different Kind, which are supply'd by the Blood, they go in an Instant into such an Effervescency, as that, by the mutual Strife of both, and the Exagitation of the Carneous Fibres, which are porous and lax, they are stuffed up and drawn into Corrugations, and that from all these Corrugations on both Sides the Contraction of the Muscle does proceed; but that, after this Contraction ceases, the pure Spirits that are remaining behind and settled, do again retract for a great Part into the Tendinous Fibres, so as to leave the other Particles in the Carneous Fibres behind them: And that lastly, the Loss of these is made good by the Blood, as that of the others is by the Nerves.

' To bring the Spirits that are laid up in the Tendinous Fibres from thence into the Carneous Fibres, in order to perform the Functions of Motion there, *the said Ingenious Gentleman supposes*, ' that there is required a certain Impulse or Instinct, or *Symbolum* communicated by the Nerves; and this *(he says)* is perform'd by some other Spirits convey'd thither from the Brain, viz. these Spirits which flow into the Parts, do, by their various Appulse

upon the Muscles, dispose the implanted Spirits to the different Motions either of Expansion or Retrocession.

This *Hypothesis* of the most Learned Dr. Willis, I must confess, is very ingenious; but after all, in my Opinion does not in all Respects seem consonant to Truth: For first of all, this before said Inflation of the Fibres is subject to various Difficulties, and such as are not of the least Moment; for in case it were so, that the Contraction of the Muscle did proceed from the Inflation of the Fibres, it would of Necessity follow, that the Muscle being in its Contraction distended outwards, must swell up into a much greater Bulk; whereas it has been found by Experience, that a contracted Muscle is drawn closer together within it self, that it becomes hard, and that if it is not lessen'd, at least it is not tumefied so much as is required for its Contraction, in case the same be supposed to proceed from an Inflation of the Fibres, as it has been long ago observed by the Learned Dr. Lower.

And tho' it seems in some Muscles when they are contracted, as if we can feel something of a Tumour, this, in my Opinion, is not owing to their being tumefied, so much as to the Muscle's Belly's being in its Contraction moved towards the fix'd or immoveable Tendon, so that this Ascend of the Muscle does represent, tho' falsely, a Tumour, when it strikes against the Hand laid upon the Muscle.

Besides that, if there were any such Thing as an elastick Matter lodged betwixt the Ducts of the Fibres, which did produce this Inflation as before said, how could it come to pass, that these Fibres should fall or subside again in an Instant? As it happens in the Twinkling of an Eye, and in the other different and momentaneous Contractions of the Fibres; for I can't comprehend, in what Manner this elastick Matter should be able in a Moment's Time to cause an Inflation in the Fibres, and extricate it self in the same Instant from those Ducts or Channels: For if it be supposed, that after this Matter is rarefied, the Passage is easy for it out of the Fibres, it would immediately pass through the Fibres without producing any such Inflation.

Furthermore, it seems not very probable, that the Animal Spirits should, in the Relaxation of a Muscle, retreat out of the carneous into the tendinous Fibres; it being not easie to be conceived, that it is that could dispose or direct these Spirits into this Motion of receding or retreating. Besides that, since, according to the Opinion of the said Learned Dr. Willis, the Animal Spirits which make their Sallies into the Fibres, do meet therewith other Particles carried thither, and that in a very great Quantity, and immediately go together with them into a mutual Effervescency, it seems, as if these Spirits would be either quite dissipated, or else transmuted into something of a quite different Nature of what they were before, and that consequently they would not be qualify'd to renew such another Effervescency.

In relation to the chief Part of the Muscle that is contracted, it is very probable, that not the Fibres, but rather the Fibrils, which run, and are transversedly inserted into them, are contracted, as shall be shewn hereafter.

As to what concerns the Intumescency of carneous Fibres, which is to be observed near the Place where any Ligature is made in them, it is to be observed, that this seems to owe its Cause rather to the Blood, which passes through those Parts, than to the Motion of the Animal Spirits being interrupted; for in case such a Fibre, when it is in such a State of Tumefaction, be wounded, the Blood will come forth plentifully. Besides, that the Tumour will continue near the Ligature, even after the Muscle being relaxed, the Contraction ceases, at which Time the Animal Spirits, according to Dr. Willis his Supposition, should not break out forward from the Tendinous Fibres; but on the contrary, retreat backwards into them.

However, I can't but agree with the said Dr. Willis in this Point, viz. That the Contraction of the Muscles does proceed from the Particles of different Sorts, being intermix'd within the Compages of the Muscles and entring into a mutual Effervescency, as shall be shewn hereafter.

I am not ignorant, that the Learned Steno, in his *Specimen of Myology*, published not very long since, is of Opinion, that there is not the least Occasion for the Accretion of

any elastick Matter for the Contraction of the Muscles, considering that the same, according to his Opinion, may be produced by the sole Immutation of their Figure, viz.

'If a Muscle from a *Parallelogrammum oblique Angulum*, is changed into a *Parallelogrammum*, the Angles of which are not so acute, which is supposed to happen thus in the Contraction of a Muscle, then is the same contracted in Length, and at the same Time tumefy'd without the Accession of any new Matter"; as may be seen in the 5th Fig. Tab. LXXXI. where let the Muscle *a, b, c, d*, be contracted *c, d, e, f*; now this Muscle, though of the same Bigness as before, nor is augmented by the Accession of any new Matter, is nevertheless contracted in Length, and besides this rises into a Tumour towards *f*.

But it does not seem probable, that the Fibres of the Muscle should be disposed to such a Motion, without the Accession of some Matter into them; for considering that the *Compages* of a Muscle, before it is contracted, is laxe or loose, it seems as if the Fibre *f*. could not be brought outwards toward *f*. but rather on the contrary inwards.

Furthermore, if it be supposed that a Muscle, after its Contraction, is of the same Bigness as before, and is not increased by the Accession of any new Matter convey'd to them, how comes it to pass, that in the State of its Contraction it becomes so tense and hard? As it is obvious to every Body, by only laying his Hand upon the Part where the Contraction of the Muscle is made.

Lastly, what is it that could contract these Fibres, and bring about this Immutation in the Muscles, if there were nothing of an additional Afflux into that Part? Besides that, it is very confident, that a certain new Matter is thro' the Nerves carry'd to the Muscle, without which the Contraction of the Muscle can't be accomplished; for in case that Nerve which is directed to a certain Muscle is cut asunder, there will be no Contraction in that Muscle for ever after.

'Tis true, it can't be deny'd, but that in case it be taken for granted that there is an Accession of some certain Matter, which flow-

flowing into the Muscle, produces its Contraction, that then this Contraction may be accomplished by the sole Mutation of its Figure, as it is represented in the foreſaid Figure, in which, whiſt the Muscle *a, b, c, d.* is inflated by the moving Influx, it muſt of Neceſſity follow, that the Fibres *a, c.* and *b, d.* in reſpect of the Tendon *c, d.* which is ſuppoſed to be immoveable, are carried towards ſtraight Angles, and that the other moveable Tendon beſides this be carried outwards, ſo that the inflated Muscle will be *c, d, e, f.*

For this Muscle, without undergoing any other Mutation, may, according to the Acceſſion of the new Matter which it receives, be extended and inflated by that Matter; and when this Variation as to its Figure happens in the Muscle, it will tumefy in Breadth, but be contracted in its Length; and thus a

Muscle may be ſhorten'd, without its Fibres ſuffering any Contraction.

But whether this Variation may take Place in a Muscle, and whether its Contraction does depend on that alone, I will not pretend to determine; tho', according to my Opinion, the Tumefaction in a contracted Muscle does not ſeem to be ſo much as is required to produce its Contraction after that Manner. Beſides that, I can't conceive or ſee what Part of the Muscle it is that's affected by the Impulſe of the moving Matter in ſuch a Contraction, ſince it would be requiſite, that rather Membranous Veficular Bodies, than the Muſcular Strings, ſhould ſuffer this forcible Contraction; whereas the Strength of the Muscle ſeems to ariſe rather from the Fibrils, and its Strings, than from any Veficular Bodies or Membranes. But of all this we ſhall have Occaſion to ſay more hereafter.

CH A P. II.

A ſhort Deſcription of a Muscle; as alſo which Part of the Muscle is contracted.

IN the Anatomy of the Muſcles, the firſt Thing that offers it ſelf to your Sight, is the Membranous Integuments wherewith every Muscle is cover'd on all Sides; next to which the *Series's* of the Carneous Fibres make their Appearance, which being parallel themſelves, are inſerted with oblique Angles into the oppoſite and parallel Tendons, according to the Obſervations made firſt of all by *Steno.*

Further you may obſerve the moſt ſurprizing *Series's* of an almoſt infinite Number of Membranous Fibrils, which being all parallel to one another, do paſs tranſverſly the Carneous Fibres, but with oblique Angles, viz. theſe *Fibrils* are inſerted into the Carneous Fibres after the ſame Manner (but in an oppoſite Situation) as the Carneous Fibres are into the Tendons; and as the Carneous Fibres by their cloſe Conjunction ſeem to form the Tendons, ſo the Collection of the Fibrils ſeems at leaſt in ſome Meaſure to make up the Fibres themſelves, as may be

ſeen in *Tab. IXXXI. Fig. 6.* in which are represented the *Series's* of the Fibres, and of the Fibrils, as they are conſpicuous in the Muſcles after they have been boil'd for a conſiderable Time.

It has been the conſtant Opinion of the Authors with us, that the Carneous Fibres of the Muſcles were chiefly thoſe that entred into a Contraction; but according to our Opinion, 'tis not the Fibres, but the Fibrils, which are inſerted tranſverſly into them, which have the greateſt Share in the Muſcular Contraction, as may be gather'd from very probable Indications.

For in caſe this Contraction did lie in the Carneous Fibres, then it would be required to perform the due Contraction of a Muscle, that the Fibres ſhould be much more ſhorten'd in Length than the Muscle it ſelf; for the Fibres being not diſpoſed according to the Length of the Muscle, but inſerted obliquely into the Tendons, as you may ſee it in the beſoreſaid Figure, it follows, that the

the Contraction of the Muscle must be much less than the Contraction of the Fibres; whereas to make a due Contraction of a Muscle, it is required that the Fibres be much more contracted than the Muscle it self, and (according to my Opinion) there is no such great Contraction of the Fibres actually existent in the Motion; for besides that in the Dissections of living Animals there is no such Contraction of the Fibres to be observed, in case the Carneous Fibres were tumefied to such a Degree, the Muscle must of Necessity augment into a great Bulk, which we see does not happen so.

But if we suppose the Contraction of the Muscle to be perform'd by the Fibrils, there is not so much Need of so great a Contraction and Intumescency; considering that their *Series's* are disposed according to the Length of the Muscle, (as may be seen in the aforementioned Figure) so that the Contraction of the Muscle is equal to the Contraction of the Fibrils.

Now it being altogether consonant to the constant Course or Custom observed by Nature, to make Use of the shortest Way in her Operations, 'tis very probable also, that the Contraction of a Muscle is performed rather by the Contraction of the Fibrils, than that of the Fibres.

Add to this, that the Fibrils being very small and very short, their Contraction, even to one half, will scarce be remarkable; for since all these Fibrils suffer a Contraction at once, it happens in the same Manner as if the Carneous Fibres were extended according to the Length of the Muscle, and were forc'd together into many Corrugations, which Contraction of theirs, tho' very considerable in it self, might be made without any remarkable Intumescency of the Muscle. Unto this I think I may add, that the Fibrils, when shorten'd, do draw and pull together the Carneous Fibres, so that it is most probable that the Contraction of the Muscle is performed by them; considering especially, that when a Muscle is contracted, it is drawn

very remarkably together, and becomes hard, which I don't see how it can be effected by any other Way, than by the Contraction of the Fibrils. But concerning the Constriction of a contracted Muscle, we shall have Occasion to speak more at large hereafter.

Besides, it is the constant Custom of Nature to accomplish her Operations by the least Means that can be, so that the Fibres seem to be too thick and rude for the chief Contraction of the Muscle, and were designed and serve rather for the Passage of the Blood, than the Animal Motions, as shall be shewn hereafter.

Unto this may be referred also, that the Shortness, as well as the almost infinite Number of the Fibrils, does not a little conduce to the Strength of the Muscle it self, and to the performing of their Traction with the greater Force.

To be short, whether we consider the Number, Size, or Situation, of the Fibrils, 'tis evident, that they are much better adapted for the Performance of the Muscular Contraction, than the Carneous Fibres: And this is further confirmed by *Autopsy* it self; for as far as ever I have been able to make my Observations upon the Inspections in the Dissections of living Animals, the Carneous Fibres do in the Contraction of the Muscle draw nearer to one another no otherwise than if they were attracted by the transverse Fibrils, that they are not shorten'd themselves, but seem to follow only the Contraction of the Fibrils.

What concerns the Ligature made at both Extremities of the Carneous Fibres, whereupon the Muscular Contraction does cease, and the Fibre does not, as it used to do, rise into a Tumefaction, as it has been observed by Dr. Willis: This I suppose to happen thus, because the Motion of the Blood and of the Animal Spirits is interrupted by these Ligatures, the Influx of which is necessary towards the performing of the Contraction of the Fibrils.

C H A P. III.

Of the Particles by Means of which the Muscular Contraction is accomplished; and first of all of the moving Particles which are supply'd by the Blood, and occasionally of the Structure and Use of the Muscular Fleſhy Part.

IN the preceding Chapter, I did endeavour to ſhew that the Muſcular Contraction was chiefly performed by Means of the Fibrils, ſo that we muſt now next of all enter into an Examination of the Cauſe which produces this Contraction of the Fibrils. It is beyond all Diſpute, that the Influx of the Animal Spirits is abſolutely neceſſary to the performing of the Function of Motion; for as much as we ſee, that when a Nerve is obſtructed or cut off, the Muſcle into which this Nerve is diſtributed, can't perform its Contraction. But notwithſtanding this, no Inference is to be drawn from thence, that this Contraction of the Muſcles does depend altogether on the Animal Spirits, ſince there are alſo other Particles required, carried thither from the ſanguineous Maſs, to accompliſh theſe Functions.

For it being evident, that the Arterial Blood does flow to the Muſcles with a full and more plentiful Stream than to the other Parts, and that in a greater Quantity than what is required for Nutrition, eſpecially in the more violent Motions, we may reaſonably conclude, that the Arterial Blood does in its Paſſage depoſite its Share, as much as is required or neceſſary towards the performing of the Contraction of the Muſcles. Beſides that, the Structure of the Muſcles is ſuch, that they draw themſelves together in their Contraction, and by that Means do very much promote the Motion of the Blood; which is the Reaſon why, when we run faſt, we find our Blood to be put into a quick Motion.

Of this you may make a very eaſy Experiment in the Venereſection of the Median Vein, which being open'd, if you contract the Muſcles that are annex'd to the Cubit, (which may be done by making a Conſtriction there with the inflected Fingers of

your Hand) you will ſee the Blood which is expreſs'd from the ſaid Muſcles by this Contraction, ruſh out with much Impetuouſity from the Vein: And this Acceleration of the Motion of the Blood in the contracted Muſcles ſeems not to be the Effect of Chance, but of a peculiar Contrivance of Nature, viz. that ſo the moving Particles of the Blood may be ſupplied from thence to the Parts that are to be moved, and after theſe are ſeparated, the remaining Part of the Blood may by the Conſtriction of the abbreviated Muſcle be expel'd as it were with a Propulſation, in order to enable it, after it has been provided with a new Supply, to make good what was ſpent before, it may be return'd thither provided with a freſh Supply or Stock of theſe moving Particles.

What we have ſaid juſt now, is further confirmed by another Experiment made by the Ingenious *Steno*; for according to his Obſervation, it is obvious, that a Muſcle can't be contracted, in caſe a Ligature be made in the Artery which is diſtributed into it, ſo that the Afflux of the Blood into the ſaid Muſcle be intercepted by the before-mention'd Ligature.

According to my Sentiment, the main Uſe of the Muſcular Fleſh is to ſeparate certain Particles from the ſanguineous Maſs, ſuch as are neceſſary for the Contraction of the Muſcles: For it is obſervable, that it is the proper Function of all Sorts of the *Parenchymata* to ſeparate ſome Particles of a peculiar Kind from the Maſs of Blood by way of Percolation, as is manifeſt in the *Parenchyma* of the Liver, of the Kidneys, and others of the ſame Sort; and therefore it is very probable, that the *Parenchyma* of the fleſhy Part which is annex'd to all the Muſcles, is contriv'd and made for the ſame Purpoſe, viz. to ſeparate by Percolation a certain

certain Kind of Particles, such as are necessary to the performing of the Contraction of the Muscles.

The better to discover the Structure and Use of the Muscular Flesh, let us examine a little in what Manner the Blood takes its Passage through the fleshy Parts.

I can't agree in Opinion with those that maintain an Extravasation of the Blood. They alledge in Behalf of this Opinion, that there would be no such Thing as Nutrition of the Parts, in case the Blood undertain'd close within its proper Vessels; for (say they) how can a Rivulet render the adjacent Meadows fertile, unless it overflows its Banks so as to leave its Particles that are to render them fertile behind it. But this supposed Extravasation of the Blood seems to be a Thing so confused, that there is but little Reason to believe or imagine, how the same should take Place in that most exquisite Fabrick of the Animal Body, where every Thing is framed with a most stupendious Contrivance and due Order.

Neither can I conceive in any Way, how the extravasated Blood should penetrate the very minute Orifices or Apertures of the Veins; for if the extravasated Blood be supposed to be diffused through the whole Body or Substance of the Muscle, it seems as if the Extremities of the Arteries and Veins must suffer a Compression from the circumambient Blood, so that the Blood would not be able to enter the Orifices of the Veins thus closed up by this Compression. Besides, that there is no such Thing as an extravasated Blood in the Muscles, is manifest from thence, that the Blood which is carried to a Muscle where a Wound is given, does not break forth all at once, which must of Necessity happen, in case the extravasated Blood were diffused through the Substance of the Muscle.

In reference therefore to the Passage of the Blood thro' the Muscles, we may rationally conclude, that the Capillary Arteries and Veins are conjoin'd together by certain Vessels of different Kinds, so that there is one continued Duct or Communication betwixt them. 'Tis my Opinion, that the Extremities of the Arteries do terminate in some peculiar Vessels, which immediately from their Beginning are propagated into certain Ducts,

or rather infinite Membranous Vesicles, conjoined together by various *Anastomoses* or Inosculations; and that the Propagations of these Vesicular Bodies being conjoin'd at last in one Duct or Channel, do terminate in the open Orifices of the Veins, so that the sanguineous Mass being thus carried through so many Windings and Tortuosities, bears some Resemblance to an Extravasation. 'Tis also very probable, that these Ducts, or Collection of the Vesicular Bodies, are extant in each Fibre in particular; for in the Dissections of living Creatures, it has been observ'd, that we may make a Section in the Interstices of the Fibres without any Appearance of Blood; whereas we see in the slightest Wound made in any of the Carneous Fibres, the Blood follows immediately.

'Tis further to be supposed, that this Collection of the sanguiferous Vesicular Bodies does make up the main Part of the Muscular Flesh; for as to what concerns the ruddy most substantial Part, it seems to be nothing else but an Affusion of the Blood, which being coagulated, adheres and grows into those Vesicles; for whilst the sanguineous Mass does take its Passage thro' these *Meanders*, and that with an even and easy Course, the thicker Particles, which are somewhat slower in their Motion, are separated, and adhere or grow to the Sides of the *Vesicula*, which at other times, *viz.* when the Blood runs with a more rapid and impetuous Course, are carried along with it: Whence it is, that in Burning Fevers, as also in frequent and violent Exercises, the Muscular Parts being bereaved of these, the Body becomes emaciated by Degrees.

As to the Use of the *Parenchyma Carnosum*, it is very probable, that the said *Vesicula*, together with the thick Part of the Blood that adheres to them, are instead of so many *Colatoria* or Sives, through which the moving Parts of the sanguineous Mass are separated by Percolation, as has been intimated before.

Add to this, that the *Parenchyma* of the Flesh being turgid with Blood, does suffer a Compression by the Constriction of the contracted Muscle, and the natural Subsidiency of the Parts; whence it is, that the moving Particles, as it were by a strong Expression, are forced into the Parts to be moved, to perform the Functions of Motion.

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Concerning the Nature of the moving Particles that are separated from the Mass of Blood, it is our Opinion, that they are of a *saline* and *fulphureous* Nature; for I believe, that the sulphureous and saline Particles being, by their continual Fermentation in the sanguineous Mass (as represented by us in another Place) raised to the highest Degree of Volatility, and intricated within one another, are separated from the Blood by the Help of the Muscular *Parenchyma*, and discharged into the Parts that are to be moved, in order to their Contraction.

For it must be observed, that when we use violent Exercises, we shall be sensible of the Loss of a considerable Part of Fat, and that by continual Labours and Exercise it will be quite lost; whereas on the contrary, such Animals as are idle, and not employ'd in hard laborious Exercises, will grow fat apace, so that the Fat will adhere or grow to their Muscles very plentifully.

Hence it is, that we may rationally conclude, that the sulphureous Particles of the Blood, of which the Fat does consist, do also bear their Share in the performing of the Contraction of the Muscles, since those Animals that are emaciated by continual Labour, seem to lose their Fat for no other Reason but because the sulphureous Parts of the Blood, or the Fat, are spent and consumed in the Muscular Contractions; whereas when the Parts to be moved have ceased for a long Time from being contracted, the sulphureous Particles are not consumed in the Contraction of the Fibrils, but by

the Means of their proper Vessels, are carried to their peculiar Receptacles, all which, if carried thither in a sufficient Quantity, make or form what we call the *Fat*.

Put that the adipous Particles are convey'd by some peculiar Vessels, is apparent from thence, that the sanguiferous Vessels that are dispersed through the Body or Substance of the Muscle, don't reach so far as to the Fat, which most commonly adheres to all the Muscles; so that these sulphureous Particles whereof the Fat does consist, cannot proceed immediately from the Blood, but they must of Necessity be carried thither from the interior Part of the Muscle by some peculiar Vessels. Besides that, it is evident from Anatomical Observations, that there lie certain Membranous Vessels dispersed here and there through the Substance of the Fat, which do reach or are propagated to the interior Parts of the Muscles.

The Fat being thus laid up in its proper Repositories or Receptacles, though it in all Probability does not return towards the Parts that are moved, must nevertheless not be look'd upon in the least as an useless Excrement, but is subservient to various Uses, as to support the tender, and to lubricate some other Parts. But of this we shall have Occasion to speak more at large hereafter, it being now Time we should enter into an Inquiry also of the Nature of the Animal Spirits, the Influx of which is also required in order to perform the Contraction of the Muscles.

CHAP. IV.

That the Animal Spirits by which the Contraction of the Muscles is performed, do consist of nitro-aerious Particles; Occasionally of the Motion of the Brain.

IN relation to the Animal Spirits, and their Nature, we may probably conclude, that they, as far as they conduce to the Animal Motion, do consist of a nitro-aerious Spirit.

To clear this Point the better, we suppose above all Things, that the nitro-aerious Particles, which we have shewn you in another

Place to be convey'd into the Blood by Inspiration, do also bear their Share in the performing of the Function of Motion; which Opinion we have asserted before.

For in our Treatise of Respiration, we have long ago made this Observation, that the Animals in their violent Exercises, as for Instance when they run very fast, are oblig'd

to stretch or strain their Respiration to the utmost; which seems to happen thus; because in these violent Motions the nitro-aerious Particles are separated and consumed in and for the Contractions of the Muscles, so that of Necessity we must fetch our Breath oftner, that so the Blood may obtain a fresh Supply for what it has lost, I mean, of those nitro-aerious Particles which are required for the performing of the Functions of Motion.

For we don't make more reiterated Respirations in these violent Exercises, because the Blood should flow in a greater Quantity to the *Præcordia*; and being push'd forward by the more frequent Subsidiency of the Lungs, may pass thro' them with the more Facility; for we see, that in Fevers, when the Blood is hurried on with a very rapid Current, that the Respiration is not more intense than otherwise; and that the Blood may continue its Passage through the Lungs, notwithstanding their Motion is ceased, has been shewn in another Place.

It would be in vain to say, that in violent Exercises the Respiration is often reiterated to cool the over-heated Blood; for thence it would follow by a natural Consequence, that in Fevers, where the Blood is as it were in a Flame, there would be a Necessity also for a more frequent Respiration. Besides that, the Air which is inspired does conduce rather to augment than to allay the Heat of the Blood, as has been shewn before; so that to speak more properly, the Blood, by Means of the Contraction of the Muscles, caused by the violent and frequent Motions, is rather deprived of its fermentative Particles, and apt to incline to a Coagulation; and that upon that Account there is a Necessity for a more frequent Respiration, to wit, that by this Means the lesser Expence of the fermentative Particles being made good, the true Fermentation of the Blood be maintained: From whence it follows, that the nitro-aerious Particles, on which the Fermentation of the Blood does depend, which are separated from the Mass of Blood in violent Motions, are spent and lost in the Contractions of the Muscles.

From what has been said, we conclude, that the *nitro-aerious* Particles are necessary towards the performing of the Contraction

of the Muscles; as will appear more evidently from what follows.

I think it ought to be taken for granted, that the Motion of the Muscles is accomplished by Means of the Particles of different Kinds being intermix'd together; for I cannot conceive by what other Ways or Means the Animal Motion can be perform'd: For as to what relates to the *Elator* and the *Pondus*, by Means of which, Machines used to be set in Motion, neither of these can take Place in the Fabrick of the Humane Parts, so far as their Force soon ceases. It seems therefore more consonant to Reason, that the Function of Motion is performed by the Means of Particles of different Kinds, which being intermix'd according to the Will and Pleasure of the Soul, do raise one another into a very quick and mutual Exagitation. In Confirmation of which Opinion we may add, that, in order to the accomplishing of this Contraction of the Muscles, we do not only stand in Need of the Animal Spirits carried thither by the Nerves from the Brain, but also of the Aid of some other Particles supply'd by the Blood; as has been intimated before.

Now let us therefore see what Nature these Particles are of by which the Muscular Motion is accomplished.

In reference to this Point, the most common Opinion is, that the Motion of the Muscles does depend on the Salts of different Kinds, intermix'd together, and raised into a mutual Effervescency in the Parts that are to be moved. But to raise such an Effervescency, it is requisite, that one of these Salts should be an Acid, and the other of a pure saline Nature; whether it be fix'd or volatile, matters not. But it seems very probable, that there is no such Thing as an Acid in the sanguineous Mass, unless it be in a morbid State; for the Blood, whilst in a Disposition of Health, is not impregnated with any other but a volatile Salt, or at least an acid, a saline, or *armoniac* Salt.

Neither is there any Reason to believe that the acid Salt should have any Share in moving the Parts that are to be moved, the Acids being Enemies to the tender and nice Structure of the Fibrils, which are much impaired whenever any acid Liquor is poured upon them.

Besides this, in case we suppose two such Salts of a contrary Nature, be they else what they will, to come from the Mass of Blood, how comes it to pass, that these, whilst intermix'd in the Blood, do not act upon and destroy one another, as it is observable in the Salts of a contrary Nature? Add to this, that such an Effervescency of the contrary Salts has no Relation to the Parts that are to be moved; because Salts of a contrary Nature, whenever mix'd together, are never united without a Coagulation, which Coagulation cannot be admitted to take Place in the most minute Structure of the Fibrils. Neither must we pass by in Silence here, that an Effervescency rais'd by the Conflict of Salts of a contrary Nature is made very slow, and of some Continuance, and therefore not at all suitable to the momentaneous Contractions of the Muscles, as has been intimated above.

For to accomplish the Contraction of the Muscles, the Agitation of the elastick Particles must be such as may be performed in a Moment's Time, without any Coagulation: And I much question, whether there be any other such like Fermentation in Nature, besides that only Effervescency of the nitro-aerious and salino-sulphureous Particles, which are apt, according to their natural Disposition, to set one another into a very quick Motion.

'Tis therefore in this Effervescency we must look for the Contraction of the Muscles; for since the other moving Particles are of a sulphureo-saline Nature, as I have endeavoured to shew before, 'tis requisite that the other moving Particles should be of a nitro-aerious Nature, these being only qualified for the putting of the salino-sulphureous Particles into an Agitation.

That the nitro-aerious and sulphureous Particles, when mix'd together, will go into an Effervescency together, I hope, is evident from what has been said upon that Point in another Place; unto which we may here add this following Experiment: *viz.*

Mix some Spirit of Wine highly rectified, with some Spirit of Nitre clear'd from all its Phlegm as it ought to be, and you will immediately see them go into a strong Effervescency, especially if they be placed near a

warm Place: The Reason of which seems to be, that the nitro-aerious Particles, where-with the Spirit of Nitre does abound, (as has been shewn in another Place) and the most volatile salino-sulphureous Particles, where-of the Spirit of Wine does consist, do raise themselves (according to their Natures) into a mutual Agitation. Neither is there any Reason to assert, that the Spirit of Nitre, in reference to its saline and acid Part, has any Contrariety to the sulphureous Particles of the Wine.

For as the nitro-aerious Spirit entering into a Conflict with the Sulphur of the Earth, does raise that Fermentation in which the Motion and Life of all the Vegetables does consist; and in the same Manner likewise as the same Spirit, when convey'd into the Mass of Blood by the Help of Respiration, and there going into an Effervescency with the salino-sulphureous Particles of the Blood, does produce the vital Heat and Motion, as I have endeavour'd to shew in another Place; so it is very probable, that the Animal Life likewise, and the Function of Motion, owes its Rise to the same Particles, when more exalted, and raised to their highest Pitch of Vigour: For, according to the Notion I have of this Matter, the nitro-aerious Particles which make their Irruptions from the Brain into the Parts that are to be moved, meeting there with the salino-sulphureous Particles, go into an Effervescency, by which mutual Agitation the Contraction of the Muscles is performed in the same Manner as has been said before.

Hence it is, that for the Continuation of the Animal Motion, it is absolutely necessary that there be always at Hand a constant Supply of salino-sulphureous and of nitro-aerious Particles in the Mass of Blood; and the more intense this Contraction of the Muscles is, as in hard Labours, and in violent Exercises, the more is this Stock of the salino-sulphureous and nitro-aerious Particles exhausted; to make good which Loss, Respiration was not only designed, but also the Body is to be refresh'd and supply'd with a good Quantity of such Aliments as abound in salino-sulphureous Particles: Whence it is, that all such Things as consist of a considerable Quantity of volatile Salt and Sulphur,

phur, are before all others proper to restore those that have spent their Vigour and Strength by continued Labours.

From what has been said, we may account for that intense Heat which is observed in the moving Parts in violent Exercises. This Incalcescency is commonly attributed to the Motion of the Body it self; but in the Motion of Animals, there is not such an Attrition of their Members (whence this Heat only can arise) as is able to produce such an intense Heat.

'Tis therefore most probable to believe, that the Heat in the Muscles, when they are much contracted, does owe its Cause to the nitro-aerious Particles, which are put into a violent Agitation in them at that Time; for that all Heat is produced from the Agitation of them, I have endeavoured to prove in another Place.

And here I cannot but take Notice by the by, that the Ancients were not altogether in the wrong, when they asserted, that the Head Spring of the vital Heat was in the Heart; not that we must imagine, that there is something, I know not what, like a Lamp or Flame always burning within its sacred Recesses; but considering that the Heart is always in Exercise to the Continuation of the Motion of the Blood, the nitro-aerious and sulphureous Particles do without Intermision continue their alternative Effervescencies in its muscular Part, and these being put in Motion, this must of Necessity produce a considerable Heat.

Besides that, from the before-said *Hypothesis* we may account for another *Phænomenon*, viz. why the Sweat that is sent forth in violent Motions, is of a saline and a very penetrating Nature; viz. the most subtile nitro-aerious Particles, as well as the salino-sulphureous, from the Intermixture of which the Contraction of the Muscles does depend, being forced outward together with the *Serum*, do render it very aerious and penetrant. But the Reason why the Sweat is acid and salt, seems to be, because the volatile Salts of the Blood being intimately united with the sulphureous Particles, are by the Effervescency made in the Contraction of the Muscles (in the same Manner as has been described before) for some Part of them dissolved.

From what has been said hitherto, it is in some Measure evident, that the muscular Motion does depend on the nitro-aerious Particles, as well as the nitro-sulphureous, which put one another in an Agitation within the Parts that are to be moved.

But among these Particles, by Means of which the muscular Contraction is performed, some, viz. the Animal Spirits, are carried from the Brain through the Ducts of the Nerves into the Parts that are to be moved; and some others are supply'd from the Mass of Blood, as has been shewn before.

We must therefore in the next Place examine, Whether the nitro-aerious Particles do constitute the moving Particles that are supply'd from the Blood, or the others which come from the Brain, i. e. the Animal Spirits? Concerning this Question, I was for some Time in Suspence, whether the nitro-aerious Particles were not immediately convey'd from the Mass of Blood to the Parts that are to be moved: But upon a more serious Consideration, it seem'd most probable to me, that the moving Particles supply'd from the Blood were of a salino-sulphureous Nature, as may be seen in some Measure by what has been said above; so that by a natural Consequence the nitro-aerious Particles do proceed from the Brain, and consequently are the Animal Spirits themselves. It is certainly much more probable, that a nitro-aerious Spirit, than that the salino-sulphureous Particles, should have their Rise from the Brain; for there is no such Thing as any sulphureous Particles to be seen in the Brain, whereas they are found every where disposed thro' the Substance of the Body of the Muscle.

Besides that, all sulphureous Things seem to be Enemies to the Animal Spirits; for all the Liquids that abound with volatile Sulphurs, as the Spirit of Wine, and the Oils of Vegetables extracted according to the Chymical Art, if applied too hastily, create a Disturbance in the Brain and in the Animal Spirits; nay, sometimes will produce a Giddiness, and even a Phrenzy, and convulsive Motions; whereas on the contrary, the whole Structure of the Brain seems to be such as is very commodious and proper for the Separation of the nitro-aerious Spi-

Spirits from the Mass of Blood, and to preserve it as such, as will be shewn more at large hereafter.

In reference to the Nature of the Animal Spirits, I must confess the Authority of the Learned Dr. Willis did not a little incline my Opinion, at first to agree with him when he says that the Animal Spirits do obtain the Nature of a volatile Salt; for these are his Words in the 11th Chap. of his Treatise of the Distempers of the Brains. 'The Animal Spirits in their natural and healthy Dispositions seem in some Measure to be not unlike a Spirituous Liquour, abounding in a volatile Salt, which is distill'd from the Blood.

But upon better Considerations found, that since the muscular Contraction is performed by Particles of different Kinds mix'd together, (according to the Sentiment of the said ingenious Person himself, and according as it seems most consonant to Reason,) if the Animal Spirits did consist of a volatile Salt, then the other moving Particles which are supply'd from the Blood, must of Necessity consist of an acid Salt; without which the Animal Spirits when they meet together would not go into an Effervescency with them; but there seems to be but little or rather no Reason at all to imagine, that any Place can be allow'd for an acid Salt in a healthy Disposition of the Body, and much less in those Parts of it that are to be moved, as has been shewn before.

And supposing that there is such an acid Liquid existent in the Fibres, How can it come to pass that the Animal Spirits should go into an Effervescency with them, considering that these Spirits themselves do sometimes turn into an acid Humour? as it happens in the Melancholy Madnes, according to the Learned Doctor's own Opinion.

'Tis for these Reasons that it is much more probable to imagine, that the Animal Spirits do consist of nitro-aerious Particles, which, according to the Directions of the Soul or Mind, making an Irruption into the Parts that are to be moved, and meeting there with the Salino-sulphureous Particles, by their unmutual Agitation, according to their Nature, the Contraction of the Fibrils is accomplished in the same Manner as has been said before.

'Tis my Opinion, that the Animal Spirits are of such a Nature, as not to be subject to any Mutation or Change, and that as to those Diseases which are commonly attributed to their vitious Disposition, I believe those few proceed either from the Interruption of the *Tenor* of the Animal Spirits, or else from their inordinate Motions; as will be shewn more at large hereafter.

The nitro-aerious Particles seem to approach nearest to the Nature of the Animal Spirits, as being very subtle, of a quick Motion, and endued with an elastick Virtue; for the nitro-aerious Particles are very apt to go into a very quick Motion almost like the Fire, as has been shewn in another Place. The Animal Spirits are the same which penetrate the Filaments of the Nerves in an Instant, tho' not provided with any visible Cavities; and being at last carried to the Muscles, do by quick Motions produce their momentaneous Contractions.

Furthermore, the Animal Spirits, like the nitro-aerious Particles, are so thin and subtil, that they are immediately dissipated, without as much as leaving any Tract behind them: Unto which may be added, that the nitro-aerious Particles are no less necessary towards the Preservation of Life than the Animal Spirits.

It would certainly be a very difficult Matter to conceive, why all Animals should be under so absolute a Necessity of Inspiration of the Air, that they can't even subsist as much as one Moment without it, were it not that the nitro-aerious Spirits, which are in Effect the Animal Spirits themselves, did bear the principal Share in the Support of the Animal Life. Hence it is, that, according as there is Occasion for a greater, as in violent Motions, or of a less Quantity, as in the State of Quiet of the Body, of the Animal Spirits, there is required also either a larger or a less Supply of the nitro-aerious Particles; which is the Reason why in violent Motions Respiration is so much increased.

Let us, I beg you, consider besides all this, from whence it is, that we can promise ourselves a sufficient Stock or Supply of the Animal Spirits for those that exhaust their Strength by continual Labours, were it not for that inexhaustible Spring, I mean the Air, which must be call'd to our Aid, and to supply

supply all the Deficiencies; for it seems more than probable, that there is a much greater Quantity of the Animal Spirits consumed in the Muscular Contraction, than what is generally believed: For it is impossible to conceive, how a Muscle should be able to contract it self with so excessive a Force, were it not that the elastick Particles did concur in a very great Quantity to this Contraction: Whence it is, that when we are upon any violent Exercises, we draw our Breath with more Strength, *viz.* to make good that excessive Loss of the Animal Spirits sustained during the Endeavours that are made in such-like violent Motions.

Nay, it seems as if there were a very considerable Quantity of Animal Spirits required, not only to maintain the Motion of the Muscles, but also for the Support of Life, it being very probable, that Life cannot be supported without a constant Concatenation, and as it were a Current, of the Animal Spirits, which pass through the Brain, or at least through the *Cerebellum*; which is the Reason, that whenever the Respiration or the Motion of the Heart or Blood is interrupted only for one Moment, the Animal dies in an Instant. But of this more hereafter.

For the better Confirmation of what has been said before, may be added what has been observed by the Learned *Malpighius* in relation to the Respiration of Insects; for he has made this Observation, That *those blackish Spots* which are to be observed on both Sides of the Spine in the Insects, are so many Windpipes or *Trachea* through which Insects draw in the Air; for so soon as these Windpipes are besmeared with Oil, the Insect dies in an Instant, because its Respiration is intercepted. The said great Man has further observed, that certain Twigs of the aforesaid *Trachea* are inserted here and there within the Spinal Marrow.

But to accommodate this to the Point in Question, it cannot be denied, but that the Animal Spirits, in those Animals that are reckon'd among the perfect ones, are elaborated no where else but in the Brain, and that from thence, as from the Head Spring, they are derived and disseminated to the Spinal Marrow, and to those Nerves that have their Rise there; whence it is, that when

the Head of such an Animal is cut off, the Influx of the Animal Spirits into the Spinal Marrow is quite intercepted, and consequently the Parts of the decollated Body does drop immediately without any Motion.

But in those Creatures that are less perfect, as in Insects, which, if cut asunder, will continue to live, the Animal Spirits are elaborated chiefly and immediately, and laid up, like in their proper Reservatories, not only in the Brain, but also in the Profuberancies of the Spinal Marrow, like as into so many *Cerebelli*, which are placed all along the Length of the said Spinal Marrow; whence it is, that though these Insects are cut into Pieces, the Animal Spirits are still supplied to that Part of the Spinal Marrow that remains entire, which therefore for some Time after continues its Motion and Life.

But that the Animal Spirits may be convey'd into the Spinal Marrow of the Insects, it was absolutely necessary, that certain Windholes or *Bronchie* should be propagated into them, as actually they are, that so the nitro-aerious Particles of which the Animal Spirits do consist, may by their Means be carried into the Spinal Marrow. Hence it is, that when some of these aforesaid Windholes or Pipes are besmeared with Oil, the adjacent Parts being thereby deprived of their constant Supply of the nitro-aerious Particles, and of the Animal Spirits, do immediately grow paralitick, whilst the other Parts continue well.

But in the more perfect Animals, the nitro-aerious Particles are only convey'd into the Blood by Means of the Lungs, and after that, by the Pulsation of the Heart, and the Supply of the Blood that goes to the Brain, are from its *Appendix* convey'd to the Spinal Marrow; so that we see, when the *Trachea Arteria* is stop'd up, so that the Inspiration is intercepted, or that the Motion of the Heart or of the Blood is suppress'd, or else if the Brain be under an ill Disposition, and consequently the nitro-aerious Particles designed for the Elaboration of the Animal Spirits are not carried to the Brain, the Animal dies immediately.

From whence it seems in some Measure to be apparent, (according to my Opinion) that the nitro-aerious Particles, which, by the

Help of Respiration, are transfer'd into the Mass of Blood, and thence to the Brain, are the Animal Spirits themselves. Unto this may be added, that if you put a living Creature into a Glass, out of which the Air has been drawn by Mr. Boyle's Air Pump, it is in a little Time after seiz'd with dreadful Convulsions; for the Animal Spirits being deprived of their usual and due Supply by the withdrawing of the Air, do, according to their wonted Custom, run into disorderly Motions, and making tumultuary Irruptions upon the Nerves, produce these Convulsions, till the Animal, for Want of Air and Spirits, dies.

Unto this you may add also, that such as are affected with the *English* Consumption, grow very weak, and are almost quite destitute of Animal Spirits; the Reason of which seems to be no other, than that their Lungs being consumptive and flaccid, the nitro-aerious Spirit is not in a sufficient Quantity carried into the Mass of Blood to produce the Animal Spirits.

Neither must we forget in this Place to observe, that in pestilential Diseases the Brain is chiefly affected, and the Oeconomy of the Animal Spirits most of all disturbed; for considering that when the Plague does make its dreadful Havock far and near, the nitro-aerious Spirit takes the venomous Infection, and consequently the Animal Spirits which are made by it, must also of Necessity be affected with a venomous Disposition.

Besides that, the nitro-aerious Particles seem the most proper for the making of the Animal Spirits; for this is the Nature of Spirits, that sometimes they will be as it were idle and unactive, but on the contrary, at other times extremely active and nimble. In the same Manner the nitro-aerious Spirit used to be in a different State; for sometimes it is very quiet, but at other times most active, and moving with great Agility: For whenever the nitro-aerious Spirit is intermix'd with the sulphureous Particles, it moves with a most swift Motion, almost like the Fire; but when it is sed from these sulphureous Particles, it remains in a State of Quiet, as has been shewn in another Place.

'Tis also very well worth our Observa-

tion here, that the Nature of the Brain is such, as is very proper, and adapted altogether, to collect and lay up the nitro-aerious Particles; because the Brain, above all other Parts, is destitute of sulphureous Particles, which are apt to put the nitro-aerious Spirit into an Agitation, and to subdue it; and as it is of a saline Nature, as we may call it, so it is the more proper and convenient for to detain the nitro-aerious Spirit.

From this *Hypothesis* of ours, we may also deduce a probable Reason why the Animal Spirits are most affected by the Light beyond any other sensible Objects, and why they are put in Motion by it, and consequently awaken the Animal; so that we see, there is a Necessity for the Animal to have its Eyes shut or closed when 'tis to sleep, to keep out the Light; whereas in respect to the other Senses, there is Admittance given to the Objects even when the Animal is asleep.

To solve this *Phenomenon*, it is to be consider'd, that the Light depends on the Motion of the nitro-aerious Particles disseminated thro' the Air, as I have endeavour'd to prove in another Place. Now considering that Animal Spirits do consist of nitro-aerious Particles, 'tis consonant to Reason, that they are very apt to follow the Motion of the luminous Particles, they being of the same Kind with them: Whence probably it is also, that when a violent Streak is given upon the Eye, it seems as if a Fire did break out before it.

'Tis very probable, that the nitro-aerious Particles, which are lodg'd in great Quantity in the Optick Nerves, are, by a violent Concussion made upon them, irritated into a Motion altogether like unto that which is requisite to produce what we call *Light*. But whether certain Animals, as for Instance, the Cats, with the Help of their luminous Motion, are able to put also the nitro-aerious Spirits which are in the Eye in Motion, I will not pretend to determine, tho' it seems not improbable to be so, because a Cat makes use of the Sense of Sight even in the Night-time.

According to this *Hypothesis* may be solv'd also another *Phenomenon*, viz. how it comes to pass, that when an Animal is Thunder-struck, it is often kill'd without any outward

ward Tract or Sign of a Stroke given, or any other Hurt received. To clear this Point the better, we must repeat here what we have endeavour'd to prove in another Place, *viz.* That the Thunder has its Rise from thence, that the nitro-aerious Particles which are expanded throughout the whole Atmosphere, are, by the violent Concussion of the Air, put into a luminous, and sometimes into a fiery, Motion: And considering that the nitro-aerious Particles do constitute the Animal Spirits, it may happen sometimes so, that those that are in the Brain, follow the Motion of the thundering nitro-aerious Particles of the Air, so that the Animal Spirits may properly be said rather to *thunder*, than to be *Thunder-struck*: Whence it is, that the same Animal Spirits being put into a most violent Motion, and as it were set on Fire, are dissipated in an Instant; so that by reason of the Light which is lighted in the Brain, the Animal being deprived of its natural Light and Spirit, dies. But of this more hereafter.

But we must not neglect to take Notice here, that the Animals are necessitated after violent Exercises to fetch their Breath very fast for some Time; the Reason of which is, that the Blood returning from the Brain to the Heart, is for the most part deprived of its nitro-aerious Particles, these being separated in the Brain and the *Cerebellum* to supply the Loss of the Animal Spirits: Whence it is, that a considerable Part of the Blood, for Want of these nitro-aerious Particles, is deprived in some Measure of its due Fermentation, and inclinable to a Coagulation; for that the Fermentation and Motion of the Blood does depend on the nitro-aerious Particles, has been shewn in another Place, and been observed likewise by the Learned *Dr. Thruston*.

So that in order to keep up the Fermentation and Fluidity of the sanguineous Mass, for some Time after a violent Motion is over, we stand in Need ever of more repeated and larger Respirations. Hence it is also apparent, why the Blood that is taken out of a Vein in convulsive Paroxysms, is commonly very thick, and somewhat grumous.

For in the more violent Contraction of the Muscles, there happens a considerable Loss, not only of the nitro-aerious, but al-

so of the salino-sulphureous, Particles, (from the mutual Conflict of which depends the Fermentation and Fluidity of the Blood) and consequently the Mass of Blood must of Necessity incline towards a Coagulation; and this happens most frequently, when the Parts that are subservient to Respiration, do suffer Convulsions, because there the Loss of the nitro-aerious Particles sustained during the convulsive Motions, is not repaired, by reason of the Respiration being almost suppress'd, as it is at other times after violent Motions, where it is made good by reiterated Respiration.

Against what has been said hitherto, it may probably be objected, That since the Animal Spirits do constitute the chief Part of the Body, it is very probable upon that Account, that they don't derive their Origine from the Air, which is an extraneous Thing, and foreign to the Body of the Animals, but rather from the most noble Particles of the Blood, such as are exalted to their highest Pitch of Subtility and Vigour; and that it seems not very suitable to that most artificial and admirable Contrivance of the Machine of the Animal, to be beholding for its Motion to an extraneous Principle.

Unto this it is answer'd, That let the Animal Spirits be of what Kind they will, 'tis certain that they are supply'd from outwards; for even supposing them to be elaborated by the Blood, since the sanguineous Mass is renew'd by our daily Food, it must of Necessity follow, that the Spirits, which have their Rise from them, owe their Origine also to something that is extraneous: And what Reason therefore is there to alledge upon that Account, that the Animal Spirits may not rather have their Rise from the Air, than from the Aliments that are taken inwardly? 'Tis certain, that the Air is impregnated with very active and most subtle Particles; and there is such an absolute Necessity of drawing it by Inspiration into our Bodies, that we are not able so much as to live one Moment without it. Besides that, it seems that the great and continual Losses that are sustained in the Animal Spirits, can't be repaired any other Way than by the Air.

As to what is alledg'd concerning the artificial Contrivance of the Machine of the Animal,

Animal, it consists in this, that the several Parts of the Body are framed in so exact a Symmetry, that most stupendious Effects are produced there by vulgar Causes.

And here it is to be observed by the by, that when I make the nitro-aerious Particles the Animal Spirits, I would not be understood so, as if I did assert the nitro-aerious Spirit to be the sensitive Soul it self; for it is my Opinion, that the Soul is a Thing very different from the Animal Spirits, as consisting of a Matter much more subtil and ætherious, but that the nitro-aerious Particles, *i. e.* the Animal Spirits, must be considered as its chief Instrument.

For as to what relates to the sensitive Soul, I cannot have any other Apprehension of it, than that it is a certain *Aura* or Breath participating of a divine Nature, endued with a Sensation from the first Creation that is carried all over the World; a small Portion of which being contained in a Subject in its natural Disposition, does produce such Functions, as (to our great Admiration) we see happen in the Bodies of Animals.

It is also my Opinion, that this spirituous Matter being without any animated Body, does neither feel, nor has any other Action, but lies as it were dormant and idle, much after the same Manner as it happens in the sensitive Soul when the Animal is fast asleep.

The Afflux of the Arterial Blood alone does not seem sufficient to carry a competent Supply of nitro-aerious Spirits to the Brain; and 'tis upon this Account that it seems very probable to me, that the thick *Meninx* or Membrane which incloses the Brain, has something of a Pulsation belonging to it; so that by its Contraction, the Blood that is carried thither is squeeze'd or press'd out, as well as the nitro-aerious Particles, which are press'd from the Blood into the Brain, almost after the same Manner as the other moving Particles of the Muscles are thrust into the Parts to be moved by their Constriction.

That there is such a Pulsation in the *Dura Mater*, is confirm'd by Experience; for in the Fractures of the Skull, when the Brain does sometimes appear, one may see it to rise upwards, and soon after to subside or settle downwards, and so alternatively; so

that it seems as if this Motion of the Brain did act according to that of the Pulsation of the Heart.

And truly, when I consider the Thickness and Strength of the *Dura Mater*, as well as its nervous Fibres, I can't but conceive, that this Membrane, like the rest, is design'd for some Motion. It seems very probable to me, that the *Dura Mater* is in the Nature of another *Diaphragm*, by the Means whereof the Brain does draw in, and in some Measure respire again, the nitro-aerious Spirits.

'Tis very probable that the Motion of the before-said *Meninx* is natural, yet so as that it is in our Power either to increase or retard its Pulsation at Pleasure, after the same Manner as we do in the Motion of the Parts belonging to Respiration: And it is also no less probable, that (according to its different Motions) there arise different Effects in the Animal Body; for, in Proportion as this Membrane does contract it self either more or less, there is a greater or less Quantity of the nitro-aerious Particles, *i. e.* of the Animal Spirits, carried to the Brain, and from thence into the Nerves.

Hence it is, that whenever there is an extraordinary Quantity of Animal Spirits required for the performing of some extraordinary Function of Motion or of Sensation, we are obliged to draw the Head and Brain together, as every one may try in himself; and this Constriction of the Brain seems to proceed from the hard *Meninx* which contracts it self. Certain it is, that when we are in a great Passion, *viz.* when we endeavour either to defend or revenge our selves, this Membrane is as it were put into a Convulsion, and seems to contract it self as well as the Brain; whence it is, that the nitro-aerious Spirits being forced into the Brain, and thence into the Nerves, with great Impetuosity, do produce certain involuntary Motions, and trembling Convulsions.

Unto this I may add, that it seems very probable that Sneezing is produced by the *Dura Mater* when it is strongly contracted, and forces the Animal Spirits with Impetuosity into the Nerves dedicated to Respiration; for it is obvious beyond Dispute, that when we sneeze, the Membranes of the Brain are chiefly affected.

Nay, I do almost suspect, that the Pulsation of the Heart, as well as Respiration, both of which are performed alternatively, do depend on the Pulsation of the *Dura Membræ* that incloses the *Cerebellum*.

It is also not improbable, that the Epilepsy, as well as the Apoplexy, do sometimes owe their Origine either to a Convulsion or to a Palsey of the said Membrane; because in these Distempers, the Brain is most commonly found to be free from any vicious Indisposition: In Confirmation of which it must be consider'd also, that such Things as abound in volatile Salts and Sulphurs, as the *Ol. Succini*, and such like other Things, are very proficuous in the aforesaid Diseases.

Neither must we suppose, that the salino-sulphureous Liquids do penetrate thro' the Brain it self, and corroborate it; because sulphureous Remedies seem to be Enemies to the Brain, and if taken too frequently, will break into the innermost Recesses of the Brain, and cause Convulsions there; as has been shewn in another Place. But the true Reason why these beforementioned Oils are proper and proficuous in these Diseases, must be imagined to be this, because they are apt and proper to corroborate the moving Parts and pervious Fibres; it having been found by Experience, that such Things as consist of volatile Salts and Sulphurs, are very proper and qualified to restore chiefly the true Tone of the Fibres of the Muscles: Whence it is, that these Sorts of Medicaments are very beneficial to the Membranes of the Brains, not only when they are weaken'd, but even when they are almost torn asunder; and consequently are of excellent Use and Benefit in the before said Diseases.

If I may be permitted to give you my further Conjectures concerning the Use and Function of the said Membranes, it seems very probable to me, that Sleep owes its Origine to this, *viz.* that the Membranes which inclose the Brain, but not the *Cerebellum*, do either quite cease in their Motion, or at least do move but very slightly; so that the nitro-aerious Particles being not carried to the Brain, the Animal Functions must of Necessity be interrupted.

And when we see the Animal, tired out with hard Labour, to be urg'd to a Necessity of sleeping, this *Phænomenon* must not

be accounted for thus; as if there was a Defect, or not a sufficient Supply, of Animal Spirits, or of the nitro-aerious Particles, because of these there is always an exhaustible Stock in the Air; but rather, that the salino-sulphureous Particles of the Blood are consumed by Watching and Labour: And the Defect or Want of the salino-sulphureous Particles does regard the Parts that are to be moved, and not the Brain, unless in so far as the *Meninges* of the Brain, which must be reckon'd among the Parts to be moved, cannot perform their Pulsations, if there be not a sufficient Supply of salino-sulphureous Particles in the Blood.

It is therefore my Opinion, that Sleep owes its Origine to this; that the salino-sulphureous Particles are so far consumed by hard Labours, Exercises, or Watching; that the *Meninges* of the Brain can't, by reason of the Want of them, perform their Motion; and this seems to be done by a peculiar Providence and Contrivance of Nature, *viz.* that since the salino-sulphureous Particles of the Blood are almost exhausted by Watching, the Remainder of these Particles should be reserved for such natural Functions as are absolutely necessary for the Support of Life.

Hence it was, that there was a Necessity for the Membrane that surrounds the Brain to cease now and then from its Motion, that so the Residue of the moving Particles might be employ'd and bestow'd upon the Motion of the Membrane that incloses the *Cerebellum*, in order to perform the other natural Functions. And here it is very observable, that though whilst we are asleep, the spontaneous Animal Functions, which are performed with the Assistance of the Brain, are interrupted for some Time; nevertheless the Functions of the *Cerebellum*, and the natural Motions, are continued as much or rather more during our Sleep than when we are awake.

As a further Confirmation of what has been alledg'd hitherto, we may add, that when we first awaken from our Sleep, we find our Brain turgid with Blood; and somewhat heavy or lumpish. The Reason of this seems to be, that whilst we are asleep, the Membranes of the Brain ceasing in their Pulsation, the Motion of the Blood is not at this Time further'd by the Contraction of the

the beforeſaid Membranes ſo much as when we are awake, and conſequently the Blood muſt of Neceſſity be detain'd and ſtagnate for ſome ſmall Time in the Membranes of the Brain. But all this while, when we are aſleep, the Arterial Blood finding its Paſſage thro' the Brain intercepted in ſome Meaſure, is in the greater Quantity carried to the *Cerebellum*; and this is the Reaſon why the nitro-aerious Particles do paſs in a greater Quantity whiſt we are aſleep into the *Cerebellum*, and the Nerves that have their Riſe from thence; and therefore it is, that thoſe natural Functions that depend on the *Cerebellum*, are performed better whiſt we are aſleep than when we are awake.

From what has been ſaid, we may account alſo, why in the ſoporofe Affections

ſo ſmall a Share of Reſpiration is ſufficient to the Support of Life; for we ſee in theſe Diſeaſes that Reſpiration is in a Manner quite ſuppreſs'd, ſo that there are not wanting Inſtances of ſome People that were affected with them having been buried for dead when they were actually alive: For conſidering that in the ſoporofe Diſeaſes the nitro-aerious Particles are carried only to the *Cerebellum*, and thence to thoſe Nerves that are deſigned for the natural Functions; and that beſides this, theſe Functions are but very ſuperficially performed in theſe Affections; 'tis therefore that there is not any conſiderable Loſs or Conſumption made of the nitro aerious Particles, and conſequently a very ſlender Share of Reſpiration is ſufficient to repair it.

CHAP. V.

Of the Ferments of the Stomach, the Sweetbread, and the Spleen; as alſo ſomething relating to thoſe Diſeaſes that depend on the Animal Spirits.

BY this *Hypotheſis* of ours concerning the Nature of the Animal Spirits, not only the Efferveſcency that is made in the Parts to be moved, but alſo the Cauſes of the Fermentations, and all Manner of Concoctions, in the *Viſcera* of the Animals, may be very conveniently explained.

And firſt of all, as to the Diſteſtion that is performed in the Stomach, 'tis the common Opinion, that there is ſome acid Ferment lodged within the Stomach; but they are not able to tell us from whence this Acid ſhould or does take its Origine; for it is obvious by the Anatomical Obſervations, that there is no ſuch Thing as an Acid lodg'd in the Stomach when in a State of Health: And as to what concerns the ſowr *Ructus*, theſe ſeem rather to owe their Riſe to ſome ill digeſted Aliments, than ſome natural acid Liquor or Juice.

But here it is objected how it comes to paſs, that when we take the Filings of Steel inwardly, it is corroded in the Stomach, and turn'd as it were into a Vitriol; for after the taking of Chalybeate Medicines inwardly, a certain ſulphureous and vitriolate Scent or

Smell may be perceived in the Throat, juſt the ſame as is commonly obſerved in the Steel or Iron when corroded by ſome acid Liquid. Beſides that, Milk will coagulate in the Stomach as if it had been turned to Curd by ſome acid Liquor, and our Aliments, after they are in the Stomach, will often contract a Sowrneſs.

In reference to this, I lay down as a Rule or Suppoſition, That the Diſteſtion of the Aliments is performed by the Animal Spirits carried thither by the Nerves, which are in great Numbers inſerted into the Stomach; ſo that, according as the Animal Spirits are either in greater or leſs Quantity convey'd to the *Viſcera* deſigned for Diſteſtion, the Diſteſtion of the Aliments will be performed either the faſter or the ſlower.

Hence it is, that in caſe a Man immediately after eating is intent on his Studies, or puzzling his Brain about ſome difficult Matters, by Means whereof Part of the Animal Spirits are by this attentive Contemplation, and extraordinary Agitation of the Mind, detained in the Brain, the Office of Diſteſtion is not accompliſhed as it ought to be

for Want of Animal Spirits; but the Aliments remaining undigested in the Stomach, the Animal feels a Heaviness and Oppression in it, as every one may and does perceive in himself; whereas at another Time on the contrary, when the Mind is free from any puzzling Thoughts or Considerations, as likewise when we are asleep, the Concoction of the Aliments succeeds very well; viz. because the Animal Spirits being not then employed in or diverted by any other Functions, are in the greater Quantity carried to the *Viscera* designed for Digestion.

Hence it is also, that soon after a plentiful Dinner or Supper we are very much inclined to Sleep; viz. the Stomach being full of Victuals and Drink, the Animal Spirits for the most part are carried to the *Cerebellum*, and thence to the inferior Region or *Venter* of the Body, there to assist in the Action or Office of Concoction; so that there being scarce any left behind in the Brain to perform the sensory and voluntary Functions, hence it is, that we have enough to do to keep our selves from sleeping.

Now considering that the Animal Spirits do consist of nitro-aerious Particles, 'tis no very hard Task to conceive in what Manner the aforesaid Effects are produced by them in the Stomach.

For though the nitro-aerious Spirit is no Acid, yet by it Iron may be corroded and turn'd into Vitriol, fix'd Salts may be made fluid, and the whole *Compages* or Frame of Things may be open'd or dissolv'd as by the universal *Menstruum*; as I have endeavour'd to prove in another Place.

It seems then most agreeable to Reason, that the so much celebrated Ferment of the Stomach does chiefly consist of nitro-aerious Particles, which being thro' the Nerves convey'd into the Membranes of the Stomach, are there (as it seems very probable) intermix'd with some other proper Juice, separated from the Blood with the Help of the glandulous Membranes of which the Stomach does consist, both of which being by some peculiar Vessels carried into the Cavity of the Stomach, do make up its fermentative Juice.

Hence it is, that a serene and thin Air is so very convenient and proper, as well to create an Appetite, as to settle the Stomach

after any Excess committed in eating and drinking, as is sufficiently known by Experience; whereas in a thick Air, such as is infected with noxious Vapours or Exhalations, the Stomach is often oppress'd by the Aliments we take.

Add to this, that from the Bladder that is found in most Fishes full of an aerious Substance, there is a Communication by Means of a certain Canal or Duct into the Stomach; which seems to intimate, that something of an aerious Nature is required for the better Concretion of the Aliments; as has been observed likewise by the Learned Dr. Needham.

For considering that the Fishes draw but a slender or moderate Quantity of Air in from the Water, it was (as it seems) necessary, that this aerious Ferment should be laid up in some certain Receptacle, from whence it might be carried in such a Quantity as was requisite for the Digestion of the Aliments.

But whether in terrestrial Animals, besides the nitro-aerious Spirits carried by the Nerves to the Stomach, there be also an aerious Ferment convey'd thither immediately from the sanguineous Mass, I am not able to determine.

In my Opinion, the digestive Juice of the Stomach approaches pretty near to the Nature of the *Saliva*; for the *Saliva* seems to be a Composition of the nitro-aerious Particles, which by Means of the Nerves are discharged upon the maxillary Glandules, and there intermix'd with the serous *Latex* convey'd thither by the Blood; and I take it for granted, that the *Saliva* being in Mastication intermix'd with the Aliments, does not only further their Deglutition, but also contributes a considerable Share towards their Digestion.

When the Stomach is empty, and without any Aliments within its Cavity, its interior Membranes are (as it seems very probable) vellicated by the nitro-aerious Particles, which produces that which we call Hunger. The Aliments after Chewing and Deglutition are by the Ferment of the Stomach converted into a *Chymus*, which being fallen down into the *Intestinum Duodenum*, is there mix'd with the *Bile*, so that by this Mixture with a new Ferment as it were, the *Chymus*

is still more fermented and further concocted: For the Bile consisting of salino-sulphureous Particles, it must of Necessity happen, that they should go into an Effervescency with the *Chymus*, which consists of and abounds in nitro-aerious Particles; and that the Bile is endued with a fermentative Quality, seems to be evident from thence, that if some Part of it be mix'd with a Paste made of Flower, it will ferment and raise that Paste; as has been shewn in another Place.

Of the Ferment of the Pancreas or Sweetbread.

I Think the *Pancreas* deserves to be number'd also among the *Viscera* that are designed for and contribute to the Concoction, it being very probable that the Nerves, many of which are dispersed thro' the *Pancreas*, are intended for the carrying of the nitro-aerious Particles thither, which being provided there with a proper Vehicle separated from the Blood by the Means of this Gland, are discharged into the *Intestinum Duodenum* thro' the *Viscarian* Duct for the further Fermentation of the *Chymus*; viz. whenever this Pancreatick Juice, which abounds in nitro-aerious Particles, meets with the *Chymus* abounding with bileous, i. e. with salino-sulphureous Particles, there must of Necessity arise a very intense Effervescency from the Intermixture of both of them, by Means whereof it is very probable that the Concoction of the *Chymus* is accomplished.

After I had written this concerning the *Viscera*, a Treatise of the Ingenious *Reyner de Graaf* concerning the Pancreatick Juice did come to my Hands, in which the Learned Author proves the Existency of the Pancreatick Juice beyond all Contradiction, as likewise confirms what I have said concerning its Use.

But after all, I cannot perswade my self that the Pancreatick Juice, if in a healthy Disposition, should be of the Nature of Acids: Neither is it probable that the said Juice, when intermix'd with the Bile in the Intestines, should enter into an Effervescency, because the acid Salt of the Pancreatick Juice does enter into a Conflict with the

fix'd or volatile Salt whereof the Bile does consist, as the Ingenious Mr. *De Graaf* is of Opinion that it does; for this Effervescency of the Salts of a contrary Nature does not seem very suitable to the Constitution of the Animal Oeconomy, viz. considering that it is so soon over, neither is effected without a Coagulation; as has been said before.

Besides this, every acid Salt, if mix'd with a Liquid of a salino-sulphureous Nature, fixes its salino-sulphureous Particles, and destroys them; and together with them turns into a *Calx* or *Caput mortuum*, that remains indissoluble, as it is observable in the *Lac Sulphuris*, and in the Bile it self if mix'd with some acid Liquid; whence it is also, that the acid Salts are very proper to allay the inordinate Fermentations of the Bile.

But on the contrary, in the natural Fermentation that is made in the Intestines, the salino-sulphureous Particles of the Bile are raised to their due Volatility, as is evident by the Stink that comes from the Excrements after their Ejection, and the Inflammability of the *Flatus* that break out from behind.

'Tis therefore most probable, that the Effervescency arising upon the Intermixture of the Pancreatick Juice with the Bile, owes its Cause to this; that the nitro-aerious Particles wherewith that Juice does abound, does enter into an Effervescency with the salino-sulphureous Particles of the *Bilis*, this producing such a Fermentation as is most proper to exalt the salino-sulphureous Particles of the Bile; as has been shewn already in another Place.

Of the Use of the Spleen.

LET us also, before we conclude this Head of Effervescencies, give you some Conjectures concerning the Use of the Spleen according to this our *Hypothesis*. If we consider the most admirable Structure of the Spleen, its Bulk, as well as the numerous Branches of Nerves belonging to it, besides the great Afflux of Blood that is carried thither; I say, if we make due Reflection upon all these Things, we can't but conclude, that the Spleen (which is found in all Sorts of Animals) must certainly be designed for some publick Office or Function.

What

What is most surprizing is, that the Animals, even after the Spleen is quite cut out, don't only live without it, but even don't find any considerable manifest Inconvenience for Want of it.

'Tis this that has rais'd so many Disputes concerning the Office or Function of the Spleen among the Anatomical Authors, that the Spleen seems to be almost as troublesome a Piece to the Physicians, as to those that are afflicted with its Disease; so that it seems as if Nature, by giving to the Spleen its dark black Colour, had intimated to us, that it should be kept concealed and involved in Darknes. Some Authors have assigned so frivolous a Use to the *Spleen*, as would make any Man laugh even tho' he were half eaten up with the Spleen.

To make you therefore the more sensible of my true Sentiments concerning the Spleen, I shall be oblig'd to repeat here again what I have said already before, *viz.* That it is very probably absolutely necessary for the Support of the Life of the Animal, that the Animal Spirits, *i. e.* the nitro-aerious Particles, should have a constant free Passage thro' the Brain, or at least thro' the *Cerebellum*; and that 'tis upon that Account, that when Respiration, or the Motion of the Heart, is suppress'd or interrupted only for one Moment, the more perfect Animals die in an Instant.

From this Supposition this Inference flows naturally, That the nitro-aerious Particles must without Intermission be carried back from the Brain by the Means of certain Vessels; and it is more than probable, that the Nerves being designed for the natural Motions, those of them that go to the *Viscera* were intended also to bring the Animal Spirits from the *Cerebellum*.

Now considering that there is sometimes a greater, sometimes a less, Quantity of the nitro-aerious Spirits required for the just Performance of the natural Functions, and especially the Concoction of the Aliments, and that the nitro-aerious Particles do almost with an equal Stream flow to the *Cerebellum*, it was necessary that those of the superfluous nitro-aerious Particles, *i. e.* such of them as would not be employ'd in the natural Functions, should be carried off another Way.

And in Effect it seems very probable, that

the Spleen was fram'd on purpose that these superfluous nitro-aerious Particles might by its Assistance be thoroughly mix'd with the sanguineous Mass.

For these nitro-aerious Particles being through the Nerves of the Spleen discharged into the Spleen, are by it intermix'd in all their most minute Parts with the Mass of Blood, after having been before-hand dispersed through its *Parenchyma*: Whence it is, that by the Commixture of the nitro-aerious Particles with the salino-sulphureous of the Blood in a great, but equal, Quantity, there arises a very considerable, but not too impetuous, an Effervescency; so that the Spleen seems to perform these three following Functions:

1. The nitro-aerious Particles which pass continually and successively thro' the Brain, and are not employ'd in the natural or animal Functions, are reconvey'd into the Mass of Blood, and intimately mix'd with it.

2. To carry the nitro-aerious Particles in a just Quantity and due Order to the *Viscera* that are designed for the Concoction of the Aliments; for according as these *Viscera* are less or more replenish'd with or empty of Aliments, so they stand in Need either of a greater or less Quantity and Afflux of these fermentative Particles.

3. To qualify the nitro-aerious Particles when put into Motion and Vigour, and intermix'd with the salino-sulphureous of the Blood in the *Compages* of the Spleen in their most minute Parts, to raise such an Effervescency in the sanguineous Mass, as is requisite to raise its salino-sulphureous Particles to a just Degree or Pitch of Volatility.

As to what relates to the first Offices assigned to the Spleen, these seem to be manifested to us by these various Intertextures and Communications betwixt the *Nervi splenetici* and the other Nerves that are dispersed thro' the other *Viscera*; for by the Means of these Communications, it comes to pass that the nitro-aerious Particles, according as Occasion requires, sometimes in greater, sometimes in less, Quantity, are carried to the *Viscera* that are designed for the Concoction of the Aliments, and for the Performance of the other natural Functions, and that the superfluous or remaining nitro-aerious Particles may be carried into the Spleen.

This

This furnishes us with a Reason why, when the Spleen is turn'd scirrhus, or else suffers an Obstruction, the Patient is troubled with Belching, and hypochondriack *Flatus*; for, considering that in such a Case the nitro-aerious Particles can't any longer, as they used to do before, pass through the obstructed Spleen, they are carried promiscuously, and without any due Order or Moderation, into the Stomach, the *Pancreas*, and the other *Viscera* design'd for Concoction: Whence it is, that these being in too great a Quantity mix'd with the *Chymus* in the Stomach, and the other Parts of the *Abdomen*, the Concoction of the Aliments, and of the *Chymus*, is performed too fast; so that of Consequence there must arise abundance of flatulent and impetuous Fermentations in those Parts.

'Tis furthermore to be considered, that whenever the nitro-aerious Spirits can't be discharged into the Spleen, by reason of its being obstructed, 'tis very probable, that they sometimes regurgitate towards the Brain and the *Cerebellum*; by which preposterous Motion, the true Motion of the animal Spirits is perverted also, and consequently the Brain and animal Oeconomy is much disturbed, as it is frequently observed to happen in hypochondriack Affections; tho' this may arise also from some other Cause, as shall be shewn hereafter.

Unto this may be added also in this Place, that in young Children the Spleen is of a florid ruddy Colour; whereas in adult Persons it turns into a blackish blue Colour: This Difference in its Colour seems to come from thence, that the nitro-aerious Particles are in young Children carried only in a very slender Quantity to the Spleen, so that they scarce produce any Effervescency at all there, as will be shewn more at large hereafter. And the Reason why the Spleen does not as yet perform its Office in young Infants, seems to be this:

The *Fetus* in the Womb, as also a newborn Infant, don't perform any Exercises, or at least no violent ones; and consequently there is no Necessity for any extraordinary or violent Motion of the Heart and the Parts design'd for Respiration, for these natural Functions are chiefly augmented or increased in case of any violent Exercises or Motions

of the Body, as has been shewn before. Hence it is, that the nitro-aerious Particles are transmitted very slowly, and with an even Current, into the *Cerebellum*, and such Nerves as have their Rise from thence; but more especially in the Womb, where the Infant does not make use of the Parts design'd for Respiration. Whence it is, that the Spleen is useless all that Time; for considering that the nitro-aerious Particles pass only with a very slender Stream thro' the *Cerebellum*, they are very near altogether employed and spent in the performing of the natural Functions: But when the Animal grows older, and begins to be used to more violent Exercises, there is a Necessity for a greater Quantity of these nitro-aerious Particles to be carried thro' the *Cerebellum*; so that by this Time the nitro-aerious Spirits do open to themselves certain spacious Ducts in the *Cerebellum*, whilst the Structure of the Brain is made more firm and compact; so that upon that Account the nitro-aerious Particles may afterwards take their Passage with much more Ease and Plenty through the Brain, and the Nerves that have their Rise from thence. And considering also, that these Particles are not altogether expended in the performing of the natural Functions in due Manner, it is of an absolute Necessity, that this superfluous Part of the nitro-aerious Spirits should be discharged by the Help of some *Viscum*, i. e. by the Spleen, into the sanguineous Mass, and be mix'd with it in its most minute Parts.

Unto this may be added, that whilst the *Fetus* remains as yet within the Womb, the *Viscera* that are design'd for the Concoction of the Aliments, do either not perform their Offices at all, or if they do, it is in a very slight superficial Manner; whence it is, that the nitro-aerious Spirits are not as yet carried, or at least in a very slender Quantity to the *Viscera*; and consequently there is not the least Necessity for any Part of them to be convey'd to the Spleen.

'Tis further to be observed, that the Infant in the Womb, or soon after it is born, is fed most constantly, or at least very frequently, so that its Stomach is never empty of Victuals; and therefore the nitro-aerious Spirits do with one continued Stream, and without any Period or Intervals, flow to the

the *Viscera* design'd for Concoction : But when the Animal is come to its full Growth, he takes his Aliments at certain Intervals of Time, so that his Stomach is sometimes full and at other Times empty of Victuals ; and consequently the nitro-aerious Particles must of Necessity, sometimes in a greater, and other Times in a less Quantity, be carried to the *Viscera* design'd for Concoction.

And that this Afflux of the nitro-aerious Particles might be performed in due Order to the *Viscera*, there was a Necessity for a certain *Viscus*, in the *Parenchyma* of which the superfluous Remainers of the nitro-aerious Spirits might be deposited, as has been shewn before.

As the chief Office belonging to the *Spleen* does not take Place in Infants, so there is no Necessity alio for its other Function ; viz. the more intense Effervescency of the Blood (which we told you was made in the *Spleen*) in young Children : It being very probable, that the foresaid Fermentation which is made in the *Spleen* was intended for and produces chiefly this Effect, that the saline sulphureous Particles of the Blood are by it raised to their due Pitch of Volatility, for their better performing of the Functions of Motion and Procreation, which two Functions are not suitable to the tender Age of young Infants.

That there is such an Effervescency made in the *Parenchyma* of the *Spleen*, by the Commixture of the nitro-aerious Particles carried thither by the Help of the Nerves with the saline sulphureous Particles of the Blood, may be gathered from the following Reasons.

It has been found by Experience, that when there is an Obstruction in the *Spleen* arising from a *Scirrhus*, that the sanguineous Mass is deprived of its due Fermentation, and remains crude, and without Spirits ; so that most commonly it is followed by a Dropsy or a *Chlorosis*. And from whence this Fermentation in the *Spleen* should be able to take its Rise, unless it be from the nitro-aerious Particles which go into an Effervescency with the saline-sulphureous Particles of the Blood, I am free to confess I know not.

For I cannot by any Means agree in Opinion with those Authors, who tell us, That

the thick and firm Part of the Blood, being detained in the Compages of the *Spleen*, does by its long Stay there contract a fermentative Nature ; for in case it be supposed, that any of the Particles of the Blood were stop'd any where in their Motion, and did stagnate, How is it possible for those that follow to continue their Motion, without producing (of Necessity) Tumours and Inflammations in that Part where the Circulation of the Blood is thus interrupted ? Besides, that those numerous Twigs of the Nerves that are dispersed thro' the *Spleen*, seem to be design'd, and to serve, for no other Use than to carry the fermentative Particles thither.

Add to this, that, as in case when the Fermentation in the *Spleen* is too remiss, the Blood becomes crude ; so on the contrary, if it proves extraordinary, beyond its due Measure, the sanguineous Mass does acquire something of an adust and utrabilearious Nature.

As for Instance : In the Fire, the nitro-aerious Particles going into too excessive an Effervescency with the saline-sulphureous Particles, do burn them up, and turn them into a *Fuligo* in a Moment's Time, as we have had Occasion to shew in another Place. In the same Manner, in case it so happens that the nitro-aerious Particles are raised into too violent an Effervescency in the *Parenchyma* of the *Spleen*, it will certainly be, that these Particles contract an adust and fuliginous Nature, which being fix'd within the Compages of the *Spleen*, its Colour will seem to be a dark Purple, inclining to Black.

This utrabilearious Disposition, or Diathesis of the Blood, may owe its Origine to Two different Causes :

(1.) If the saline-sulphureous Particles of the Blood are detained in the *Spleen*, by reason of its *Parenchyma* being obstructed ; for in this Case, when their Effervescency with the nitro-aerious Particles is of too long a Continuance, they will turn adust and dry. It seems as if the Body of the *Spleen* was a Composition of two Sorts of Vessels ; some of which, viz. the nervous Fibres, are design'd for the Distribution of the nitro-aerious Particles, and the others for the Diffusion of the Blood ; and besides this
also

also for the Reception of the nitro-aerious Particles. If an Obstruction happens in the first of these two, by the Influx of the fermentative Particles being intercepted from the Spleen, the sanguineous Mass remains destitute of its due Ferment; but in case this Obstruction is in the latter, the salino-sulphureous Particles, by their being detain'd too long, and fermenting beyond due Measure, do acquire an acid and adust, or which is the same Thing in Effect, an atrabilearious Nature.

(2.) If the Compages or Frame of the Spleen is corroded, or torn asunder by any other Way, the nitro-aerious Particles are now no more, as they used to be before, intermix'd in their most minute Parts, and equally in its *Parenchyma*, but are rather hurried in a Confusion into the Mass of Blood; from whence arising too violent an Effervescency, this will render the salino-sulphureous Particles of the Blood adust and fuliginous.

From what has been said, it may easily be understood how it comes to pass, that an Animal, tho' deprived of so noble a *Viscus* as the Spleen, is nevertheless able to live; viz. that tho' the before-said Functions performed by the Spleen, are such as conduce not a little towards the Preservation of the true Animal Oeconomy, and a perfect State of Health, yet are they not of such a Necessity, but that Life may be in some Measure preserved or continued without them.

And here I can't but by the by make this Observation, That all the Parts of the Animal consist of a considerable Quantity of volatile Salt, but scarce contain any fix'd Salt; as is manifest by their Distillation, and burning them to Ashes, and yet most of the Animals feeding scarce upon any Thing else but Vegetables, in which there is very little, or scarce any volatile Salt at all, but a considerable Share of fix'd or nitrous Salt; it seems as if the fix'd Salts of the Aliments, or their nitrous Part, were within the Body of the Animal, which not improperly may be stiled the true chymical Laboratory of Nature, were transmutated into volatile Salts.

Unto this may be added, That if you take any Plant which contains no volatile Salt at all, and let it putrefy till it produces Worms, you may then draw a very considerable

deal of volatile Salt from them by Distillation.

But as to the Manner or Method of this Volatilization of the fix'd Salts of the Aliments, 'tis very probable that the various Concoctions and Fermentations made in the Bodies of Animals, do not a little conduce to this Volatilization of the Salts. But after all we have sufficient Reason to believe, that the Spleen is the chief Office or Laboratory where the nitrous Salts of the Aliments elaborated into volatile Salts.

For it is to be observ'd, that when the Vegetables are burnt to Ashes, their nitrous Salts are volatilized, and these flying upwards together with the somewhat adust sulphureous Particles, make what we call the *Fuligo*; for this *Fuligo* contains a volatile Salt, notwithstanding those Vegetables that were burnt to Ashes, and from whence it draws its Original, consisted before their Combustion only of a fix'd nitrous Salt.

It is very probable, that as when Nitre and Sulphur, being mix'd together as in the Gunpowder, are burnt together, the fix'd Salt, whereof the Nitre consists in Part, is during the Conflagration volatilized, and carried up into the Air; for were it not so, the fix'd Salt of the Nitre would remain behind after its Conflagration; viz.

In the Deflagration of the Nitre, the nitro-aerious Particles which it contains being by the Help of the sulphureous, when set on Fire, put into a very swift Motion, do break asunder the saline Particles, wherewith they were very strictly united before, into very minute Parts, and thus, as it seems very probable, do volatilize them.

And now, since by the fiery impetuous Effervescency of the nitro-aerious and sulphureous Particles, the fix'd Salts of the Vegetables may in an Instant be reduced or brought into a State of Volatility, what Reason have we not to imagine, but that the intense Effervescency of the nitro-aerious and sulphureous Particles in the Spleen should not be sufficient for the Volatilization of the fix'd or rather nitrous Salts of the Chyle? Unto this may be added also, that the salino-sulphureous Particles do turn somewhat adust and of a fuliginous Nature in the Spleen, as has been intimated before.

And here it would be no difficult Matter to prove, that all the Fermentations which are made in the Animal Body, without Exception, do arise from the Effervescency of the nitro-aerious and sulphureous Particles, were it not foreign to our present Purpose.

Of those Diseases that have a Relation to the Nitro-aerious or Animal Spirits.

From this our before said *Hypothesis* relating to the Nature of the Animal Spirits, it is easy to determine wherein the Animal Oeconomy does consist; as likewise to give and assign the Causes of most of those Diseases that have a Relation to the Function of Motion.

In order to preserve the Animal Life, it is absolutely necessary that the Lungs should be in a healthy Disposition; that so the nitro-aerious Particles may be convey'd in a sufficient Quantity into the Mass of Blood, and be intermix'd in their most minute Parts with its sulphureous Particles. Hence it is, that whenever the Lungs begin to be weak, or flaccid and consumptive, the sanguineous Mass is not fermented as it ought to be, for Want of the nitro-aerious Particles, and consequently there being a considerable Defect of the moving Particles of both Kinds, there must of Necessity follow an excessive Weakness and Want of Strength, and a Consumption of the whole Body.

Furthermore, towards the due Performance of the Animal Functions, it is required, that the nitro-aerious Particles, after they have been convey'd into the Mass of Blood, should be carried likewise to the Brain, and to the Nerves that have their Rise thence; so that whenever the nitro-aerious Particles are either not carried in a sufficient Quantity to the Brain, or else can't find a free Passage through the obstructed Nerves, the Animal Oeconomy and Function of Motion must of Necessity be much disturbed: And 'tis from thence that the Apoplexy, the Palsy, and such like other Diseases, seem very often to take their Origin, as has been said before.

As it is requisite that the nitro-aerious Particles should be carried to the Brain, so

on the contrary the salino-sulphureous Particles must not come there at all; for whenever these, either by reason of their excessive Subtilty, or else by reason of the Pores of the Brain being too open, or else by reason of the excessive Fermentation of the Blood, do break in upon the Brain, they do there put the nitro-aerious Particles, i.e. the Animal Spirits, into disorderly Motions, which produces no small Disturbance in the Animal Oeconomy; as it is very probable that it happens thus in the Epilepsy, after excessive Drinking, and such like other Diseases, because we see that when such Liquids as abound in a volatile Sulphur, such as the Spirit of Wine, the Chymical Oils of the Vegetables are taken too fast, they produce such like Diseases.

Unto this may be referr'd what I have observ'd more than once my self, viz. That I have seen some Persons that used to be afflicted with frensical and convulsive Paroxysms, the Spittle of which during these Paroxysms, if put into the Fire, would burn out into a Flame, in the Nature of an Oil or Gunpowder; for it seems very probable, that in the foresaid Case, the salino-sulphureous Particles of the Blood were exalted to such a Degree, that making a violent Irruption into the innermost Recesses of the Brain, they put the Animal Spirits into disorderly Motions.

In Reference to the Melancholy and the *Mania*, it is very probable, that the salino-sulphureous Particles of the Blood being detained in the *Parenchyma* of the Spleen, and there entering into a continued Effervescency with the nitro-aerious Spirits, do acquire an atrabilearous and malignant Nature; and that besides this they are so far subtilized, that they penetrate very far into the Brain, and raise a Disturbance among the Animal Spirits.

For it is very probable that such like Diseases, which have a Relation to the Brain, do not so much arise from any vitious Disposition of the Animal Spirits, as from their Motion being disturbed, or else from their being defective; for considering that the Animal Spirits do consist of an *Aethereal* Matter, they can't be subject to any Alterations, as has been intimated before.

For the further Preservation of the Animal Function and Motion, it is requisite, that the sanguineous Mass should be impregnated with salino-sulphureous Particles, and such as are brought to their due Degree of Exaltation; that so the nitro-aerious Particles being intermix'd with them, may raise a proportionable or due Effervescency in the Mass of Blood.

For it is necessary for the Support of the Animal Life, that the salino-sulphureous Particles should by the continued Fermentation of the Blood be raised to their just Degree of Volatility, so that being afterwards with the Help of the fleshy Part of the Muscles separated from the Blood, they may be thence carried to the Parts that are to be moved, as I have endeavoured to shew before.

But in case these salino-sulphureous Particles are not sufficiently subtilized, for want of a sufficient Fermentation of the Blood, or are not so soon as they ought to be separated from the sanguineous Mass, by reason of some vitious Disposition in the muscular fleshy Part, the Function of Motion can't be well performed, so that it is more than probable, that that spontaneous Lassitude and Heaviness, which are the common Attendants of the Scurvy and Yellow-Jaundice, proceed from that Cause; for these Symptoms which are observable in those Diseases, seem to owe their Origin not so much to any Want of Animal Spirits, as to the vitious Disposition of the muscular Flesh.

And here we may by the by take Notice also, that those slight Convulsions,

which appear like the catching in the Tendons, and are most commonly observed in lingering Fevers, may sometimes arise also from a vitious Disposition of the fleshy Part of the Muscles; forasmuch as not only the salino-sulphureous Particles, but the nitro-aerious also, penetrating through the *Parenchyma* almost consumed before, are so transmitted into the Parts that are to be moved, so that by the mutual Effervescency of both of them, there follows in all Probability these slight Contractions of the Fibrils by Intervals.

From what has been said, we may account for another Thing relating to these Diseases, *viz.* Why Exercise of the Body is so beneficial by Way of Precaution against the *Itterus* and the Scurvy, as well as against the Return of the Paroxysms of the intermittent Fevers.

For, when we put our Body in Exercise, the nitro aerious Particles are by the more intense Respiration carried in greater Quantity into the Mass of Blood, and the Motion of the Blood is much accelerated by the Contraction of the Muscles; whence it is, that the Fermentation of the Blood being increased, these Particles are subtilized, and the Paroxysm diminish'd.

Besides, that the salino-sulphureous Particles of the Blood being raised to their full Vigour, are in the Contraction of the Muscles separated from the Blood and consumed, from the too great Quantity of which in the sanguineous Mass the feverish Paroxysm takes its Rise, as has been shewn in another Place.

Of Digestion, Chylification, and the Apparatus thereunto conducing. From Glisson, Willis, Havers, Drake, &c.

THE great Author of all Things, whom, to avoid unnecessary Multiplication of Words, we often call *Nature*, having in his inscrutable Wisdom thought fit to create a great Variety of Ani-

mals, and to appoint them different Ways of subsisting, has also given them very different Organs to preserve that *Aliment* by which they are to be *nourished*.

Of these, some being to break and divide the Mass upon which they are to feed, are furnish'd with *Teeth* of different Kinds according to their several Exigencies. Those which feed upon *Flesh* have *Teeth* in every Part of both Jaws, some of which are to divide the Mass into Morfels, others to comminute and grind it after it is so divided, which from their different Offices are called *Incisores* or *Cutters*, and *Molares* or *Grinders*. Some Animals which are *graminivorous* have the *Incisores* in the lower Jaw only, because the Matter upon which they feed is easily broken into such Parcels as they can readily swallow. Of the first Sort are *Men*, *Lions*, *Bears*, *Wolves*, &c. Of the latter are all the *ruminant* Kind, such as have *Horns* and *split Hoofs*, as *Oxen*, *Deer*, *Sheep*, &c. Others, which are generally such as live upon *Grain*, or other Sorts of *Food* that do not want to be broken before they are swallow'd, have no *Teeth*; but instead of them, have an *Ingluvies* or *Crop*, wherein the *Food*, which is generally hard and dry, is macerated and soften'd before it is transmittted to the *Stomach*, which is musculous, and stronger than in other *Animals*, and serves instead of *Teeth* to break and grind the Aliment so macerated in order to *Digestion*.

Of this Sort are most Kinds of *Fowl*, especially the *granivorous*; though some others which are Birds of *Prey*, and live upon *Flesh*, have no *Teeth*, yet they have something analogous to the *Incisores*, which is generally a sharp crooked *Beak*, that serves to cut and divide that which they feed upon. These have no *Gizzards* or *musculous Stomachs*: And tho' there are some which have something like *Teeth* in their *Beaks*, yet these *Teeth* do not serve them either to divide or grind their *Food*, but to take the surer Hold of their *Prey* only, and are peculiar to the *Fishing Fowls*, whose *Prey* would otherwise be more apt to escape them; and some of the *Water Fowls* that eat *Herbs*, which, if their *Beaks* were not indented, would slip from them. These, as well as some Sorts of *Reptiles*, as the *Viper* Kind, have *Teeth*, yet swallow their *Prey* whole.

I have mentioned these several Kinds of *Dentation* in order only to examine the true Service of *Mastication*, which seems to be in

a Manner peculiar to *Men*: For tho' some other *Animals* use it, it seems to be only when their *Food* is too hard or too dry to be swallowed uncliew'd, as *Lions*, *Dogs*, *Bears*, &c. when Necessity forces them to eat *Bones*; or *Horses*, *Beans*, *Pease*, *Oats*, or other hard dry Things. In these Cases, *Mastication* seems to be purely preparatory to *Digestion*, and to be necessary to reduce the Aliment to such a State as may fit it for the Operation of the *Stomach*; but whether that contributes any more than bare *Comminution*, remains yet a Question. *Men*, who masticate more upon less Necessity than other *Animals*, are generally thought by Authors in that Action to impart something to the *Mass* besides the *Comminution*, which they suppose conduces in an extraordinary Manner by way of *Ferment* or *Menstruum* to the Solution of what they eat. But as this *Mastication* is not constant nor equal in all *Men* who seem to digest with equal Facility, it is still a reasonable Doubt, whether some Uses which they have assigned to *Mastication* be true ones or not, and whether *Luxury* and the Pleasure of *Eating* has not taught *Men* to chew more than other *Animals* in order to have the fuller Relish of their *Food*.

It is certain, that many Creatures as well provided for *Mastication* as *Men*, and whose *salival Glands* discharge as much as the humane into their Mouths, do not give themselves the Trouble of so much *Mastication*, and yet with the same *Apparatus* of *Organs* digest as quick, if not quicker, than *Men*: And if old *People* who have lost all their *Teeth* have sometimes worse *Digestions* than those who have not, other Causes may reasonably be assigned for that Infirmary of *Digestion* than the Want of *Teeth*; for it is observable, that younger Persons, who sometimes from other Accidents lose their *Teeth*, have not their *digestive Faculty* weaken'd in Proportion; not to mention, that many *Animals*, which have either no *Teeth*, or do not use those they have to chew with, seem to have as vigorous a Concoction as those that do. However, I shall not deny but that the *Comminution* of the Aliment between the *Teeth* serves to promote and hasten the Solution in the *Stomach*, which it may do by
bare

bare breaking the Cohesion, without supposing any Necessity of a *Menstruum* to do it afterwards.

Many Species of Birds, especially the little ones, that feed upon the smaller Sorts of Seeds, and have no Teeth, nor any Thing that bears Analogy to them, except the sharp Edges of their little Beaks may be thought to do so, make however a Use of their Beaks which in some Measure answers the End of *Mastication*; for by these they crack the Seeds, and with the Help of their Tongues separate the soft Pulp from the dry Husks which they let fall; and particularly all of the Parrot Kind, which will feed upon the Kernels of Nuts, and other Things which are too large to be swallow'd whole, have a Sort of Action which looks very much like Chewing, by which they nibble upon what they eat till they reduce it to very small Parts, though it seems not so much in order to mix it with any Ferment, as to reduce it to such a State as may make it pass the easier; and perhaps if they have any Saliva, it is no more than serves to lubricate and facilitate the slipping of their Food down to the Stomach, which would not be so easily effected if it were dry, as most of the Things they live upon are.

Those that generally feed upon Grain, as all the Gallinaceous, Turkey, Pheasant and Partridge Kind do, are observ'd to swallow every Thing hastily, without any Stop of it in their Mouths, or Endeavour to break it there: But then indeed they have an *Ingluvies* or Crop, where it remains some Time for *Maceration* before it be transmitted to the Stomach, which those that contend for a Ferment may say is given them instead of *Mastication* to impregnate the Aliment with such Ferments, which however is *gratis dictum*; for tho' the Crop of such Fowls be furnished with Glands, and the Grain which they eat be actually soften'd by the Soaking which it receives there, yet no real Solution or Separation of Parts is made but in the Gizzard, the Strength of whose Muscles and internal Membrane, which is hard and dry, as well as the little Stones and Grains of Sand which these little Fowl swallow, shew these Parts to be contriv'd for Attrition, and not for Fermentation, which the Narrowness and Strength of those Parts will not give Room for.

It is true, that most, if not all, Fowls of this Kind, have at the lower End of their Oesophagus or Gullet a considerable Quantity of Glands, which afford a Liquor more visible than even those of the Craw, and which many Anatomists suppose to separate a fermentative Juice. But for that we shall assign another Use, which it cannot be denied to be proper for, when we come to speak of the Conversion of the dissolv'd Aliment into Chyle.

There are divers Kinds of Animals that not only have Teeth, but have them likewise sharper and more numerous than Men; or indeed any Sort of Quadrupeds, as divers Kinds of Fishes, and all the Serpent Kind; yet none of these use them for *Mastication*, as appears from their Figure and Position, which renders them absolutely unfit for it; for in Fish, most of which have three, four or more Rows of Teeth in each Jaw, they are generally extreme sharp, and not planted opposite to each other, but so as to make when clos'd together a Kind of Indentation like that of two Saws, so wrought as to receive each other mutually, which is not a Position proper for grinding, but very convenient for catching or laying hold of any Thing. In the Serpent Kind there are likewise divers Rows of Teeth extremely sharp, but all incurvated and pointing towards the Throat, which is a Situation very proper for entangling and helping to swallow their Prey, which is usually small living Creatures, which they devour whole; but altogether unfit for dividing, comminuting or bruising. Some Sorts of Fish which prey upon the small Shell-fish, such as Cockles, Muscles and Sea-Snails, have indeed a Sort of flat broad Teeth, which resemble in some Measure in Use as well as Figure the Grinders of Land Animals, that is, they serve to break the Shells of those little Fish before-mentioned. These are variously disposed in the different Animals, some in the Throat or upper Part of the Oesophagus, as in the *Orbis marinus*; others even in the Stomach it self, as in Lobsters and Crabs, which have three at the Bottom with peculiar Muscles for their Motion and Compression.

As Providence has allotted for the Sustainance of the several Kinds of Animals a great Variety of Food, so it has given them likewise

likewise a proportionable Diversity of Organs for the Preparation of it, besides those which serve for the first *Divison* and *Mastication* already spoken of. The various Sorts of Animals have according to the different Occasions of their Kind of Aliment a great Variety of *Stomachs* both in Point of Number and Structure, which may however in the main be reduced to three principal or general Heads, of which, in order to illustrate our Notion of *Concoction*, we shall speak more particularly; for though the several *Species* be almost indefinite, yet these being most considerable and best known to us, may suffice to shew the mechanical *Apparatus* of *Nature* for this Operation.

The Three I mean, are the *Carnivorous*, the *Graminivorous*, and *Granivorous*; the different *Mechanism* of whose *Stomachs* seems under one Head or other to conclude all the Conditions necessary for the *Solution* of any Thing conducing to Animal *Nutrition*, and of each *Species* of which there are some Animals in each habitable Element, unless we will deny any *Fishes* to be strictly *granivorous*, the Water not spontaneously affording them any such Food. According to the usual Method, Hunger should first be accounted for; because it is that which provokes us to eat, and therefore the accidental Cause of all that follows in the Course of *Digestion*: But that being agreed by all Authors, however differing among themselves otherwise in Opinion, to depend upon the same active or efficient Cause with *Digestion* in it self, it will save an unnecessary Multiplication of Words to postpone the Account of it to another Place.

Authors are very little agreed about the immediate Instrument by which the Aliment is dissolv'd in the *Stomach*. Some will have it to be done by meer *Attrition* or Grinding by the *Stomach* it self: Others impute it to a forcible *Dissolution* of *Heat*. But the Opinion which is most espoused, is, That it is performed by Means of a *Ferment* or *Menstruum*; yet of what Nature or to which Clais it belongs, they are as little agreed among themselves, as those who would have it performed some other Way. Those who would have it done by *Attrition*, impute it to the rubbing of the *Stomach* upon the *Aliment* by its *peristaltick* Motion, and fortify themselves by

the Observation that Fowls and Birds that eat *Grain* and *Seeds* have not only a strong *musculous Stomach* lined inwardly with a thick tough *Membrane* fit for Grinding, but do likewise assist that Operation of the *Stomach* by swallowing Grains of *Sand* and little *Stones*, which are always found mix'd with their Meat in the *Gizzards* of those *Fowls* when they have eaten hard Meat, unless it be in *Domestick Fowls*, which have been coop'd up, and restrain'd from coming at them.

If indeed Men did feed, as these Fowls do, upon *Grain* or hard Meat without *Mastication*, and were furnished with a *Stomach* so tight, firm and strong, and so lined, this would not be an improbable *Hypothesis*: But as our Food and Manner of Eating are very different, so is the Mechanism of Nature; and as the Texture of the main Organ of Concoction, the *Stomach*, is soft, smooth and yielding, Qualities altogether opposite to those that are required to Grinding, so Providence has given us an Appetite to Things resolvable another Way. But if Grinding or *Attrition* were the humane Way of *Digestion*, the Mouth surely, and not the *Stomach*, would be the proper Place where it should be performed; for that is furnished with *Teeth*, proper Instruments for that Purpose. But whatsoever *Mastication* may contribute towards *Digestion*, that it is not the only, nor indeed the main, Instrument of it, we have already sufficiently proved by the Instances we have given of the many *Animals* whose Food is of the same Substance with ours, which *masticate* very little, and most of 'em not at all.

Wherefore if the *Stomach* were capable of grinding the *Aliment*, as some suppose, it must however in a little Time necessarily be worn, as all other Bodies which grind by Degrees are, how hard soever, especially since many Things which we use as Food are harder and tougher even than the *Stomach* it self. But they are mistaken who think that even in *granivorous Fowls* the Grain which they eat is ground in the *Gizzard* of those Creatures, which is, tho' unbroken, always macerated, swell'd and soft; so that the *Gizzard* has not much more to do than to break the *Husk* or *Cortex* of it to reduce it to a *Pulp*: And for this very End it is, that

that all these Sort of Animals are furnish'd with an *Ingluvies* or *Crop*; where the *Aliment* always makes a considerable Stay, and in which it is often found soft, tho' always unbroke, if it be *Grain*. Whether this Maceration proceeds from any Liquor separated by the *Glands* of the *Crop*, or from the Water which those *Fowls* drink, may be a reasonable Question. But as those *Glands* do not seem sufficient of themselves to furnish Liquor enough for that Purpose without their Drink; so on the other Hand it is not unreasonable to believe, that the Liquor which they afford may contribute towards making their Drink, with which it mixes more active and piercing, and so serve to soak it better and quicker than simple Water would do.

Those that would have the *Aliment* to be dissolv'd in the *Stomach* by the meer Vertue of *Heat* only, like a Kind of *Elixation* or *Stewing*, will find a great deal of Difficulty to prove their *Hypothesis* reasonable, unless they call in some other *Mechanism* or Circumstance than has yet been advanc'd: For no Body as yet have given any satisfactory Reason, why Meat should dissolve faster in the *Stomach* than it does out of it by the same Degree of *Heat*, or indeed a much greater. It would be impertinent at this Time of Day to pretend, that *Culinary Fire* was not so natural a *Dissolver* as the *Vital Animal Heat*; and yet no Care has been taken by those that hold this Opinion, to find out any other certain Property of this *Heat*, to which they might rationally ascribe that *Acceleration* of *Solution* which is observ'd in the *Stomach* by many Degrees to outstrip that *Dissolution* which is made in the usual Organs over a common Fire; and to pretend that the *Heat* was actually greater, and more intense than that which is us'd in *Cooking* our Victuals, would not only be a barefac'd Assertion against Fact, but against Reason likewise. For if it really were so, Why should not the *Stomach* it self be boil'd and dissolved by the *Heat*, as well as the Meat contained in it; which would constantly happen in all other Operations by Fire or *Heat*, if the Matter contained were as hard to be dissolv'd, and would resist as strongly, as the Vessel containing? But not to pursue an Opinion any farther, which yet may

seem to have a tolerable Foundation; we will proceed to examine the *Reigning Hypothesis*, which, taken in its largest Extent, is become of late the Favourite and only prevailing Opinion.

Those who observing how unqualified the *Stomach* of *Carnivorous Animals* generally is for *Attrition* or *Grinding*, and therefore could not believe the *Aliment* to be reduc'd to a *Pulp* that Way, and yet were not satisfied that the Incalcence of the *Stomach* was sufficient for that Operation, have call'd in the Help of a *Menstruum*, or a dissolvent Liquor, by Means of which they have thought to account better for the speedy *Resolution* of the Contents of the *Stomach*, than by either of the other more simple Ways.

But this being Matter rather of Imagination than Fact, easier to be suppos'd than prov'd, after first conceiving a Necessity of such a Liquor, they have employ'd themselves more generally to invent the *Properties* and *Qualifications* of it, than to discover whether in Reality it had a Being or no; so that this *Hypothesis* stands altogether upon Conjecture, as well as to the Existence of their *Menstruum*, as to the Nature, Properties and Derivation of it. From hence it comes to pass, that such a Variety of *Menstruums* have been invented, every Man feigning it to be such as he conceiv'd would best answer the Difficulties and Doubts which he propos'd to himself to resolve by it. Hence some have fancied it to be an *Acid*, others *Alkalious*, a third Sort *Sulphureous*, a fourth *Acido-sulphureous*, others *Alkalino-sulphureous*, *Muriatick*, or of any other Kind that their Fancy suggest'd to them as proper for the Work of *Dissolution* or exciting of *Appetite*.

As many Conjectures they have had about the Place of Nativity of this *Menstruum*: Some fetch it from the *Spleen* by the *Vas Breve*, others from the *Brain* by the *Nerves*; some from the *Blood*, by the *Arteries* in the *Stomach*; and others from the *Glands* of the Mouth and *Stomach*: In Favour of all which curious Notions, and fine Speculations, have been advanc'd at the Expence of Truth. The *Chymists*, and *Physicians* chymically given, have generally been the Patrons of an *Acid Ferment*, upon a Notion at large, that *Acids* are the universal *Dissolvents*; which Opinion many others have given into, upon the

the Account of some few *Phænomena* which they could, or thought they could resolve by it; but especially upon the Account of an *Aphorism* of *Hippocrates* which they think countenances it, though mistakenly. This Great Father of Physick has said, That *Acid Belchings*, supervening upon inveterate *Lienteries*, that is, upon Loosnesses from a too great Slipperiness of the *Intestines*, where they were not before, are a Sign of mending: And in another Place he says again the same Thing a little more at large, and affirms, that whether this Symptom come spontaneously, or be procur'd by Art, it equally cures the Distemper. From hence some would infer, that *Hippocrates* suppos'd *Acids* to contribute to good *Digestion*, because those Signs of *Acidity* in the *Stomach*, whether they come spontaneously, or were artificially superinduced, generally signifies according to him a *Solution* of that Disease which was attended with crude *Dejections*.

But surely they strain his Meaning very much, who will from either of these Passages make the *Divine Old Man* hold, that the *Acidity* of the *Stomach* was necessary ad *Eupepsiam*, in the natural State: Whereas in Truth all that he says in this Case, concludes no more than that these *Acid Belchings* signify'd, That the State of the sick Person was alter'd for the better, when the *Assumpta* remain'd so long as to turn sour upon the *Stomach*; or at most that *Acids* given inwardly, and staying so long as to send their Exhalations upwards, might contribute to the Cure; a Position which any Body may admit, without supposing an *Acid* to be the necessary Instrument of Concoction in a natural State: But what Signs soever *Acid Belchings* may be in a morbid State of this Kind; no Sort of *Ructus* or *Flatulence* whatsoever is any Sign of a good *Digestion* in a State of *Health*.

However, they that have been prepossess'd in Favour of an *Acid Menstruum* in the *Stomach*, have very greedily laid hold of this Occasion to draw so great an Authority over to their Side. The other Argument which they bring for their Opinion, from the Observation that *Acids* provoke *Appetite*, is as much strain'd and fallacious as this. For tho' *Acids* may by pricking and vellicating the *Stomach* procure a Sense of *Hunger*, and perhaps by mixing with, cutting and pre-

cipitating that viscid *Phlegm* or Matter, with which the *Stomach* is sometimes overloaded, even to the *Prostration* of *Appetite*, may accidentally procure a better *Digestion*, as they scoure and cleanse the *Stomach*; yet that is no Proof that any such Sort of *Menstruum* is necessary, and primarily employ'd by Nature in the Action of *Digestion*. For divers other Things which are not manifestly *Acid*, and some that are even opposite to, and destructive of *Acids*, will sometimes do the same Thing, as is notoriously known of the *Bitters*, especially to all *Practitioners* in *Physick*; and in some Cases, when judiciously applied, of the *Volatile Animal Salts*, and *Lixivial Vegetable* ones.

But neither do *Acids* seem naturally fit to promote Chylification, or to produce a Liquor which they are of themselves so prone to coagulate, as we daily see by those *Coagulations* which the slightest *Acids* produce in *Milk*, which is nothing else but *Chyle* a little defæcated. For tho' *Milk* upon standing will indeed turn sour without any other Mixture, yet whenever it does so, Experience shews, that the Form of the *Milk* is immediately destroy'd by it; and sufficiently demonstrates thereby, that such a State of *Acidity* as these Men would suppose, is utterly inconsistent with the Being of that Liquor. Neither do they shew us, that if they could possibly consist together, there is in a *Humane Body* any *Matrix* that should produce and furnish this *Acid Menstruum*, either in the *Stomach* or any other Part.

The sour Remains of *Chyle*, which after the learned *Glisson*, *Willis*, and so many others have taken up with for Want of a better Expedient, that might have some Shew of a real Existence, to do the Office of an acid Ferment or *Menstrum*, to cut and divide by its sharp corrosive Parts the new ingested Aliment in the *Stomach*, in so short a Time as *Digestion* is ordinarily made in, is by no Means an Instrument sufficient for the Purposes assigned. For besides that, it is a Question whether any Part of the chylous Mass does ever remain behind in *Statu sano* in the Folds of the *Stomach*, after Chylification complete, and Exinanition into the *Intestines*. It is still a further Question, Whether those Remains be naturally sour or not? *Antopsy* has seldom favour'd the affirmative Part of either

either of these Points ; but has very often decided directly to the contrary, as may be frequently experienc'd in Dogs, which are as proper Subjects for such Trials as we can even Desire. In these I have often expressly sought for these Remains of *Chyle*, says my Author, but could never see any Signs of any such Thing, nor tast any the least Degree of *Acidity* upon the inner Coat of the *Stomach*; tho' I made my Trials upon 'em when their Appetites appeared to be as keen as they could possibly well be, and consequently this supposed *Vinegar* of the *Stomach* should have been in its highest State of Exaltation. Neither would any of them turn *Milk*, tho' I sometimes boil'd 'em in it, and at others kept it in them as long as was reasonable to avoid making a fallacious Experiment.

Those that plead for these accrescent Remains of *Chyle*, thought themselves sufficiently warranted by the *Plicæ* or Folds of the inner Coat of the *Stomach* to suppose a Residue of some Kind or other, and which they, supposing it to resemble *Milk* in that Property too, expected should turn *sour*. Not to insist here upon the Infirmary of Reasonings drawn from final Causes, or from Analogies not sufficiently consider'd, both which are to be found in this Hypothesis of the *Acid Remains* of *Chyle*. It is easy to shew that the *Rugæ* or *Plicæ* of the inner Membrane of the *Stomach* were not unnecessarily fram'd only to detain this Matter, which they dream of, but upon mechanical Necessity ; for the outer *Tunic* of the *Stomach* being made *fibrous* and *contractile*, or *dilatable*, according as the *Stomach* is empty or full, the inner must necessarily obey its Motions, and either shrink up, or dilate with it ; or otherwise be wrinkled or folded up when the exterior was not dilated. But this *Contractility* is not to be found in any *glandulous* or *villous* Membranes, and consequently that it might be sometimes dilated to all the Dimensions of the *Stomach* when full, and yet comply with all its Coarctation, in its narrowest State of Contraction, which Membranes of this Nature have no Power to do, it must be made to ply and fold as this *Membrane* does.

Those that love final Reasons for such Things may be satisfied to know, that it

was by no Means convenient that the inner Coat of the *Stomach* should be endow'd with a Power of *Contraction* like the outward ; for all such *contractile Membranes* are extremely *sensible*, which upon many Scores it is not proper the Inside of the *Stomach* of *Animals* should be ; since by its *Insensibility* it is guarded against innumerable Provocations, which otherwise could not be avoided, and does here to the sensible Parts of the *Stomach* what the *Cuticula* does to the *Cutis*.

Indeed, many of those who have contended for an *acid Ferment* in the *Stomach* have been very sensible of the Insufficiency of any such *Acid* as might be form'd out of the Remains of *Chyle* ; and have looked out for other Means, notwithstanding the famous Instance of the *Rennet-Bag*, whose Liqueur being salted and pickled, bears no Analogy to what was found in the *Calves Stomach* before Pickling : Nor indeed are the Effects of the *Rennet* so made any Thing like to what they ascribe to this *Menstruum* ; for that coagulates, and this dissolves : This digests the *Milk* which the *Calf* lives upon, and that destroys it, and renders it less fit for Nourishment than before.

All the Trials that have been made by *Artificial Digestions* to dissolve *Flesh*, have been made with *Acids* of another Class and Nature than *sour Milk*, or any of that low Form of *Acids*, which they have found by Experience to preserve, not destroy it, as *Vinegar* and those *Salts* which abound with *Acids* do. Neither are those Meats so preserv'd more obedient to the Faculties of the *Stomach* for having been *pickled*, or of better Nourishment, as they should be if they contain'd any Thing congenial to the *natural Ferment* of the *Stomach* ; but on the contrary, they become harder of *Digestion*, and of less nourishing Juice.

Doctor *Havers* finding these *Acids* insufficient to dissolve and reduce *Flesh* to a Pulp, proposes an Experiment with Oil of *Vinivul*, which he says will do it. But being well aware of that obvious Objection, that it is morally impossible for the *Stomach*, without the utmost Danger, to bear so highly *corrosive* an *Acid*, he proposes to qualify it by an *oleaginous* Mixture, something like Oil of *Turpentine*. To illustrate this Notion, he puts *Raw Flesh*, *Crumbs of Bread*, Oil of *Turpentine*,

sive, and Oil of *Vitriol* together, and after shaking them well, commits them for four Hours together to *Digestion* in *Balneo Mariae*, and then, upon shaking his Glass again, he finds the Meat dissolv'd, and all together making up a thickish Pulp: From whence he concludes, That the *Menstruum*, which dissolves the Aliment in the *Stomach*, must be something of the Nature of the Mixture of those two Oils.

But, with all due Regard to the Notions and Experiments of so ingenious a Man, he has been too hasty in drawing his Conclusions, and should have register'd the other *Phænomena* of his Experiment, before he rais'd so large an *Hypothesis* upon so narrow a Bottom as the seeming Agreement in one single Accident, viz. the Reduction of the Meat to a Pulp. He should have shewn that this Pulp, or the Liquor which it afforded, agreed perfectly in *Taste*, *Colour*, *Smell*, *Consistence*, and other Accidents, with the *Chyme* or *Chyle* that result from *Animal Digestion*. But unless the Liquor which this Mass afforded was such a *sweet, soft, white, inodorous Juice*, all the Demonstration his Experiment amounts to, is, That the Oils of *Vitriol* and *Turpentine* mix'd, will resolve and reduce *Flesh* to a Pulp; but will not make *Chyle*: Which shews his Experiment something worse than unclusive, that is, it is conclusive against the Use he would make of it.

However, the Doctor is so satisfy'd in the Sufficiency of his Experiment, that he proceeds to inquire how this *Fermentative, Vitriolick, Terebinthinate Mixture*, is form'd in an Humane Body; and imagines to find two divers Sorts of Liquors, one *Acid*, and the other *Sulphureous*, separated from the *Salival Glands*, and mix'd in or about the Mouth, which tho' apt to ferment upon their first Mixture, are yet perhaps apt to do so more considerably when they come to be digested by the Heat of the *Stomach*. And in this Opinion he fortifies himself with two other Experiments, which he made after the same Manner upon Meat, with Oil of *Vitriol* mix'd severally, one with a Solution of Salt of *Tartar*, the other with Oil of *Camphire*, which did not succeed so well as the Experiment with Oil of *Turpentine*; from whence he draws this particular Conclusion: And I do rather think one of those Juices which con-

stitute the *Saliva*, to be of the Nature of Oil of *Turpentine* than of a fix'd Salt, because it will correct and temper even Oil of *Vitriol*, so as to render it more tolerable to the Fibres of the *Stomach*. Not that I suppose the acid Part of the *Saliva* to come near to the Acidity of Oil of *Vitriol*; for tho' they are mix'd, they will make a Liquor that may not be injurious to the *Stomach*: Yet that acid Juice, if it were so corrosive as Oil of *Vitriol*, would certainly be injurious and painful to the salivatory Ducts, which convey it to the Mouth before it is mix'd with the oleaginous Liquor; but I only say it is an Acid, and in some Degree approaches to the Nature of that Oil.

It is obvious for the Reader to discern, that this *Hypothesis* stands purely upon the Foot of the Experiment before mentioned, which has been shown to be insufficient. But if it were not, nothing could make it certain, but the actual Demonstration of the real Existence of such Liquors sincere and apart in the Body, and their Conveyance together into the *Stomach*. For this Purpose, the Doctor assigns two Pair of the *Salival Glands* to the Separation of the acid Liquor, and the other two Pair for the Oil of *Turpentine*, as distinctly as if he had really found and examin'd them sufficiently apart; which is the more surprizing, because it is in Reality no hard Matter to do it, and that Experience does constantly shew, that these Glands do not afford Liquors so much as sensibly distinguishable, and that the Liquor which they do afford, does not in the least resemble either Oil of *Vitriol* or Oil of *Turpentine*, or any Kind of acid or volatile essential Oil whatsoever. Nor indeed does any Part of the Body afford any such Kind of Substances at any Time, or by any Trial or Analysis whatsoever.

The Objections which lie against this *Hypothesis*, and that before-mentioned of the *sour Chyle*, reach all Sorts of *Acido-sulphureous Menstruums* in the *Stomach*: For if they be temper'd like the first, they will not be corrosive enough to procure a Solution. If they be not, but exalted *Acids*, they are liable to the same Exceptions just now offer'd, and nothing resembling either of them in either State is to be found among all the *Animal Fluids*.

Those that hold the *Menstruum* of the *Stomach* to be *alkalious* or *alkalino-sulphureous*, are somewhat more countenanced in their Opinion by the Substance which may be produced by the Help of Fire from all Sorts of *Animal Fluids*, all which yield volatile *alkalious Salts, Spirits, Phlegm, Oil, and Caput mortuum*, differing only in Proportion according to the different Mixture of the Liquor it is drawn from, whether that be *Urine, Blood, Bile, or any other*. But tho' all these Substances may be drawn from the natural Juices of the Body, and may be allowed to have præxisted in them; yet it must be confess'd, that all of them are in some Measure alter'd by the Fire, tho' that Alteration may perhaps be no more than would result from any other Resolution of their Mixture. However, if any of them will after this Separation act so vigorously upon Flesh as to dissolve it in such a Heat as that of the *Stomach* may be granted to be, that Activity is certainly owing to the *Exaltation* which it had from the Fire; for no where in the Body in its natural State do we find any *Salts or Sulphurs* so exalted, as to be capable of making such a *Dissolution*.

Neither is it easy to discern, let this exalted *Salt or Sulphur* be convey'd by what Ways or Means soever the Patrons of this Opinion will or can suppose, what hinders the *Menstruum*, that so readily dissolves the *Aliment*, from touching the *Stomach* it self, which is oftentimes of the same or slighter Texture than even the Matter which it digests; and one might as well expect, that *Aqua fortis* put upon Pieces of Iron in an *Iron Pot* should dissolve the Pieces of the Metal without touching the Vessel, which is an Experiment perhaps no Chymist would be perswaded to try.

This Objection indeed holds against all Kinds of *Menstrua* in the *Stomach* as *Digesters*, whether we suppose an *acid or alkalious, saline or sulphureous*, or however mix'd; for still the Matter to be wrought upon is the same, or of the same Kind, with the Vessel in which it is to work: They therefore that will have a *Menstruum* to be the efficient Cause of the Dissolution of the *Aliments* in the *Stomach*, are obliged to find something in the *Aliment* it self before it comes into the *Stomach*, which must be a Condition the

Stomach it self has not, that disposes it to receive the Impression of the *Menstruum*.

This some endeavour to find in the Impregnation of the *Aliment* with *Saliva* by Means of *Mastication*: But if the *Saliva* were a Juice so very acrimonious, it would be impossible for it never to offend the *Stomach*, especially considering the Quantities of it that many swallow even upon an empty *Stomach*. However, the ready *Digestion* that those Animals have which do not *masticate* at all, but swallow their Prey whole, which has already been taken Notice of, demonstrates the Insufficiency of that Cause.

Whatsoever therefore this *Ferment or Principle of Fermentation* is that sets the Wheels of Dissolution so nimbly a going, it must be something internal and inherent in the *Aliment* it self, which is an Opinion of ancient Standing, but has been rejected for that of a *Menstruum*; because an inward Cause or Condition sufficient for this great Operation was not so expressly and by Name assigned, as that speculative and curious Men might have wherewithal to satisfy their Inquiries, and judge of the Truth of the *Hypothesis*. However, they that went thus far, tho' they did not clearly and explicitly discover all, did good Service to Truth; and had they who rejected that Opinion been as scrupulous about the Evidence of those others which they took up in its Stead, it is probable it had not lost Ground, but that the *latent Property* upon which this grand *Phænomenon* depended had long e'er now been brought to Light.

In order therefore to discover what this great Secret is, which has been so long sought after with so much Industry, and so little Success, it will be necessary to consider Three Things: First, What is the State or Condition of the *Aliment*, as Nature's or our own Preparation offers it to us, before it enters the Mouth. Secondly, What Changes it undergoes in the Mouth before it reaches the *Stomach*. Thirdly, What it suffers in the *Stomach* in order to a thorough *Dissolution*.

First then, All those Substances upon which any Sorts of Animals feed may be reduced to one of these two general Heads, either of *Animal, or Vegetable*; which being Substances of their own Nature pe-

rishable or subject to Decay, their Dissolution may be hasten'd or retarded by Accidents.

Secondly, All those Substances, before they come into the Mouth, or at least as soon as they come into it, are deprived of their *Animal* or *Vegetative Life*, and consequently in a State of natural Decay, the Principles or Means of which they carry along with them, which are only put into or hasten'd in their Action by the Changes which they suffer in the Mouth or Stomach, &c.

From these Things well attended to, we shall not only be able to observe the Means which Nature uses in the Dissolution of the Food in *Animal Stomachs*, but likewise of the great Variety of Organs which she has made for that Purpose; at least we may by Attention arrive at it for those of whose Anatomy and Way of Living we know the *History*. Of all these Kinds which are reckoned perfect, the *Apparatus* for *Digestion* is most simple in the *Carnivorous*, most of which will live upon Fruits likewise, in which their Organs are suited to their Diet, which is the easiest of *Digestion*. For *Flesh*, *Fruits*, and *Sallad Herbs*, being the most succulent of all the Kinds of Food which any *Animals* naturally eat, they ferment of themselves, and come to a *digestive Solution* much more readily than *Grain* or *Seeds*, or any Kind of *dry Vegetables*; the Reason of which has been already given in discoursing of *Fermentation*.

Men do however generally prepare what they eat, especially the *Flesh*, by divers Kinds of *Dressing*. Whether this Custom was first introduced by *Luxury* or *Necessity*, is not a very material Inquiry here: But if by such *Dressing* the Parts of the Meat be render'd more loose and less coherent, it becomes thereby of easier *Digestion* in the *Stomach*; if otherwise, as in *Pickles*, long salted and dried *Meats*, it becomes harder of *Digestion* for it, and generally of worse Nourishment. Of all the Things that Men eat, the *Wintery* or *Summer Fruits* are of quickest *Solution* if strip'd of their Rinds, because the Body of them is more soft and succulent than that of other Things we eat. Next to these, in Point of quick *Solution*, are the *Lactucina* or the succulent *Sallad Herbs*, which

abounding with heterogeneous Juices, easily ferment with Heat.

The last and longest of *Digestion* of all the Kinds of Foods that *Carnivorous Animals* naturally seek, is *Flesh*, which, tho' its Parts be both succulent and soft, yet are neither so juicy, nor so soft and loosely coherent, as either of these beforementioned: And perhaps, as well out of Necessity as *Luxury*, Observation at first taught Men by *Roasting* and *Boiling*, and other Kinds of *Dressing*, to loosen the *Compages*, and soften the Parts of what they were to eat; yet many whole Countries, even to this Day, reject the whole Art of Cookery, and eat their Meat *raw*, and for any Thing we can see, as much to the Advantage of their Health and Vigour, and perhaps as much to their *Luxury*.

Men do likewise eat *Grain*, and sometimes *Roots*; but these are always prepared when used as a constant Sort of Diet, as Bread is by Grinding, Fermenting and Baking, whereby the Substance of the Grain is not only broken very small, but the mix'd Mals made of it afterwards is occasioned to cohere very loosely, and to contain a great deal of *Air*, which contributes to its future Dissolution in the *Stomach*. We do indeed use *Grain* divers other Ways besides in *Bread*, *Pyes* and *Puddings*, which have all something very analogous in their Preparation: But then we macerate and soften the *Grain* by previous Boiling or Steeping, and reduce it something nearer a State of *Fluor* than it is found in the *Craw* of *Fowls*, which does the same Office, but need not carry it so far, as our artificial Preparations do; because the *Gizzards* of *Fowls* being much stronger and more *musculous*, are consequently better able to grind it, especially by the Help of those little Stones or Grains of *Sand* which they constantly swallow.

The *Indians* many of them use *Roots* instead of *Grain* to make their Bread of: But then even the Rudest of them prepare it by some sort of *Maceration* and *Fermentation* previous to their eating of it, that may reduce it to such a State as may give the *Stomach* least Trouble in the Dissolution of it. Those *Animals* which are oblig'd by Nature to live upon Food, somewhat harder than that of Men, yet have no *Inglavies* to prepare and macerate it for the *Stomach*, such as

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Marmosets, Squirrels, Rats and Mice, that eat hard wild Fruits, *Nuts, Cheese, Roots, &c.* are observed to nibble a long Time with their *Incisores* or Fore-teeth, which in those Creatures are very long, strong and sharp, till they have exceedingly comminuted the Matters they eat, which are generally too hard for *Mastication* in these small Animals, and therefore they answer that End by gnawing that very small with their Fore-teeth, which they would not have Strength enough to break with their *Grinders*.

Some have deny'd the *Fructus Horaris* and *Lactinia* to be of easie Digestion; because they observe, that they frequently produce *Flatulencies*, Gripings, and other troublesome Symptoms. But this Objection springs from Want of considering *Digestion*, Chylification and *Nutrition*, as distinct Operations, which they confounding together, call that hard of *Digestion* which does not yield much *Chyle*, or prove good Nourishment. It is true indeed of many of these Sorts of *Fruits* and *Herbs*, that they are apt to raise Disorders in the *Stomach* and *Intestines*: But this Fault proceeds not from a Difficulty to be digested, but from too great a Promptitude to it, and from the *fermentative* Disposition of the Juices which they yield, which will not let them remain long enough in the *Stomach* and *Intestines* to be subacted or qualified by the Mixture of other Things there for good *Chyle* and Nourishment; so that their Crudity or unalter'd Simplicity of Appearance when they come away, proceeds from an over-hasty, not too *sluggish*, Solution in the *Stomach*.

This generally is the *State*, and these the Conditions, of humane Food before it comes into the Mouth. That of other Animals generally undergoes no Alteration, except it be that of *Domestick Animals*, which sometimes eat dry *Meat*, so called in Contradistinction to that which is *green*, which is harder of *Digestion* than the other; but these are generally very great *Masticators*, whether they have but one simple *Stomach*, as *Horses*; or four, as the *Ruminants* have.

The Second *State* of the *Aliment* which we propos'd to consider, is that which is introduced in the Mouth, which depends almost wholly upon *Mastication*. It seems to have two Ends: The first to bruise and commi-

nute the *Mass*, and render its Cohesion more lax, and thereby the Separation more easy in the *Stomach*: The other is to mix, and as it were incorporate it with the *Saliva*, and so render it more apt to swell and ferment in the *Stomach*. For all Liquors containing some *Air*, are apt to rarefy more or less in *Heat* according to the Proportion they contain of it. But the principal Use of the *Saliva*, as well as of the *Juice* separated in the *Stomach*, is to facilitate the Mixture or Incorporation of the several *Fluids* of the Meat and Drink after the Solution of the more solid Part is accomplished, and to unite them under that *lacteent Form* from which they are denominated *Chyle*.

This Alteration of the *Aliment* in the Mouth is more considerable in and necessary to *Ruminants*, and other Animals that feed upon drier and harder Food than the *Carnivorous* do; and indeed Mankind excepted, who enjoy it in no Proportion to them, it seems to be peculiar to that Sort of Animals, and accordingly Nature has provided for it by a peculiar Organization in giving them a *Plurality* of *Stomachs*, into the first of which their Food is usually transmitted without any other Alteration in the Mouth than being a little roll'd and wrap'd up together. This first *Stomach*, which is called the *Rumen*, is the largest of them, probably to contain as well the Drink as the whole crude *Mass* of their *Aliment*, which there lie and macerate together, and thence are transmitted again to the *Mouth* to be chew'd and comminuted in order to their further *Digestion* in the other *Ventricles*, in which Use it perfectly answers the *Ingluvies* of *Fowls*.

This Use is incomparably illustrated by the Structure of the *Rumen* or first *Ventricle* of *Camels*, in which are divers *Sacculi* that contain a considerable Quantity of Water. This is an admirable Contrivance of Providence to answer the Necessities of this *Animal*, which living in very dry desert Places, and feeding upon many Sorts of hard dry Food, such as *Rice, Millet, &c.* would very often be in Danger of starving even amidst the Plenty of dry *Meat*, which would not digest if they had not these *Reservoirs* of Water, which oftentimes the Countries thro' which they march does not afford them in a long Tract of Ground; for if the Water

which

which they drink, how large soever the Quantity might be, were not kept apart in these Receptacles, it would pass off with the other Aliment upon the first Discharge of the *Ventricle*, and they would not be able to sustain those long Journeys through dry Places, which all Accounts agree they do for Want of *digestible Food*.

These are all the Alterations that occur to be made in the *Mouth*, after which the Food is transmitted directly to the Stomach to be digested. This Operation we have already denied to be performed by a *Menstruum* either separated in the *Stomach* or convey'd thither from elsewhere, or by *Attrition* or *simple Heat*; tho' we do not deny this latter to contribute to and promote *Digestion*, as it serves to actuate the Causes of *Dissolution* innate to the *Aliment* it self.

We suppose then all Sorts of *Aliment* naturally to contain in them a *Principle of Dissolution*, if I may be allow'd to use that Term, which after the *vital* and *vegetative Faculty* is extinct begins to exert it self to the Dissolution or Destruction of the Subject; and consequently the State of Decay may be reckoned to commence, whensoever the Accession of *new Matter*, or Shifting of the *Fluids*, which in *Plants* as well as *Animals* we call *Circulation*, is at an End; though it does not always immediately shew it self in actual visible Corruption, but proceeds by various Steps or Degrees, according as the *Fluids* or containing Solids are more or less disposed to *Activity* or *Resistance*.

This Principle of *Corruption* is perhaps the same which in the State of *Circulation* and *Vegetation* was the Principle of Life; which being an active Principle, and now denied that Passage or Vent which it had before by the progressive or circulatory Motion, makes its Way irregularly, and so destroys the Continuity of the Solids in which it is included, and introduces that Change in the Face of the whole Mass which is called *Corruption*.

The *active Principle* we here mean is the *Air*, which is mix'd in considerable Quantity with all Sorts of *Fluids*, and is by Experience found as necessary to *Vegetable* as *Animal Life*. This, though its natural or essential Motion be expansive or *quaquaversum*, being introduced into all Bodies that have any Kind of Life, mix'd with the *Fluids*,

which make their Juices, has in them two Kinds of Motion; one *expansive*, by which it communicates that *intestine Motion* which all Juices have, and by which the containing Parts are gradually extended and grow; the other *circulatory* or *progressive*, which is not essential to it, but is occasioned by the Renitency of the solid Parts of those Bodies, which obliges it to take that Course which is most open and free, which is through the Vessels of *Animals* and *Plants*, which Course being stop'd, the expansive still remains, and continues to act, till by Degrees it has so far overcome the Resistance of the including Bodies, as to bring it self to an equal Degree of Expansion, with the *external Air*, which it cannot do without destroying the Texture and Continuity or *specifick Degree* of Cohesion of those *Solids*, which is what is called a *State of Corruption*.

For all Bodies, whether *fluid* or *solid*, that come within our certain Knowledge, are specifically heavier, and consequently of a closer Texture, than the *Atmosphere*, and cannot be reduced to a *Par* with it *sine Interitu Subjecti*. This *expansive* or *destructive Quality* of the *Air* in these Bodies may be two Ways actuated or promoted, either by weakening the *Tone* or *Cohesion* of the Parts of the including Body, and so facilitating the Work of the *Air*, as it happens when *Fruit* is bruised, which will corrupt in that Part much sooner than in that which is sound; or by intending the *expansive Force* of the *Air* it self by *Heat*, or other co-operating Circumstances, and so helping it to overcome the Resistance the sooner.

Both these Ways are used in many Kinds of *Animal Digestion*: The first in *Mastication*, or the other *Analogous* already sufficiently spoken to: The second by the *Heat* of the *Stomach*, which forcibly rarefying the *Air*, enables it to rend the including Bodies sooner to Pieces, and so to let loose the *Fluids*, and perhaps likewise so far to comminute several Parts of the *Solid*, as to make them sustainable in the Liquor; which latter is the Operation that compleats *Digestion* in the *Stomach*. It may perhaps be objected, That the same Substances which the *Stomach* resolves so quickly into *Particles*, do by every Day's Experience bear a much greater Heat of *culinary Fire*, and for much longer Time, in the

the common Operations of Cookery, Roasting, Boiling and Stewing, than the *Stomach* requires to resolve them into *Minima*.

To this Objection we answer, That this Degree of Expedition depends in great Measure upon the *Medium* in which it is performed. Thus in *Roasting* Meat will bear a much greater *Heat* than either in *Boiling* or *Stewing*, and the second Way much fiercer and longer than in the latter; for as *Roasting* is performed in the open *Air*, as the Parts begin externally to warm, they extend and dilate, and let out gradually Part of the rarefied included *Air*, by which Means the *Internal Succussions* on which this Dissolution depends are very much weaken'd and abated. Boiling being performed in Water, the Pressure is greater, and consequently the *Succussions* to lift up the Weight are proportionable in Strength, and by this Means the *Cottion* is hasten'd; and even in this Way there are great Differences; for the greater Weight of *Water* there is upon the Meat to be boiled, the sooner it is done. And in *Stewing*, though the *Heat* be infinitely short of what is employ'd in the other Ways of *Dressing*, the Operation is yet much more quick, because it is performed in a pretty close Vessel and full, by which Means the *Succussions* are oftner repeated, and more strongly reverberated.

These are the common Observations of *Cooks*; but there is a Way yet more exactly resembling the Operation of the *Stomach*, which is by the *Digester* invented by *Monseigneur Papin*. In this the Meat is put together with so much *Water* as serves exactly to fill the Engine; which done, the *Lid* is skrew'd on close, so as to admit of no external *Air*, and is with two or three lighted *Charcoal*, or a single small Lamp Flame, reduced to a perfect Pulp, or rather a Liquor, in a very few Minutes, as in six, eight, ten or sixteen, according to the Toughness of the Matter to be digested, or the Augmentation of this little Fire, which will in a very short Time this Way dissolve the hardest Bones themselves. The strict Closure of this Engine, so as to exclude the Intervention or Escape of *Air*, is the Occasion why the inward *Succussions* of the contained Matter, being equable and strong, resolve the whole into one seemingly *homogeneous* Body, and mix

the *aqueous*, *saline*, *oleous*, and other Particles, so strongly together, as not to be easily at least separated; but while hot to appear one Liquor, and when cold an uniform Jelly, of a Strength proportionate to the Quantity of *Flesh* or *Bones* dissolved in the *Water*.

This Experiment holds great *Analogy* with the Operation of the *Stomach*, which, tho' it does not ordinarily dissolve such hard Bodies, nor others so quick, yet according to the Degree of its *Stricture*, and the Proportion of its Heat, may be said to do the same Thing: For as the *Stomach* naturally closes upon the *Aliments* that descend into it, so it strictly embraces its Contents when full, and by keeping out any extraneous *Air*, fortifies and invigorates the *Succussions* of that which is naturally contained in the *Aliments* which it receives; which, however little it may be, is thereby enabled to break and resolve into small Particles the Bodies which included it so mix'd *inter Minima* with its Humours.

These being thus reduced into *Fluor*, and intimately mix'd with the Liquids of the Drink and Juices of the *Stomach*, compose that *lactescent Liquor* which is called *Chyle*, which is nothing but a Mixture of *oily* and *aqueous* Parts incorporated together with the *saline*; and which, while it remains mix'd with the grosser Parts in the *Stomach*, makes a thick whitish partly *fluid Mass*, which we call the *Chyme*; which, as soon as it is reduced to a Consistence loose enough to be obedient to the Pressure and *peristaltick Motion*, is gradually work'd out through the *Pylorus* into the *Duodenum*, along the Sides of which, and the rest of the *Intestina tenuia*, the *Vasa lactea* are planted, into whose extremely minute Orifices the thinner and more *fluid* Part of this *Mass* is press'd by the natural Contraction and *peristaltick Motion* of the Guts, which is that *Chyle* of which the *Blood* is afterwards composed, and in Women that give Suck the *Milk* more immediately.

When all the *Chyme* and *Chyle* is press'd out, the *Stomach*, which follows the Motions of its Contents, is again by Means of its *muscular* Coat reduced to a State of Contraction, and by that Means the inner is brought to lie in Folds, which touching, and by Means of the *peristaltick Motion* rubbing

bing lightly upon one another, produce that gentle Sense of *Fretting* or *Vellication* which we call *Hunger*; which being felt first in the upper Orifice, which is first evacuated, begins therefore first to prompt us to replenish: But as by Degrees the Remainder of the Contents are expelled, this Friction or Rubbing of the Membranes upon each other spreads gradually over the whole *Stomach*, and renders our *Hunger* more urgent and impatient, till by a new Repletion we take away the Cause.

This is all the *Fermentation* and all the *Menstruum* that are required to account for all the natural *Phænomena* of *Hunger*, *Digestion*, and *Chylification*; and tho' they who admire pompous operous Proceedings, may think it too simple a Piece of Mechanism for such great Effects, yet it is more sufficient than any of those magnificent Ways which any of the most luxuriant Fancies have been yet able to invent, and is incumber'd with none of those Inconveniencies which have attended all the *Hypotheses* by different *Menstrua* and *Fermentations* that I have yet met with: For when any of these sharp provoking Liquors which they have imagined have affected the *Stomach*, as in morbid Cases they sometimes do, the *Appetite* has been always

vicious, and the *Digestion* bad. For in such Cases the Repletion with wholesome Food not being sufficient to take off the Acrimony of such Humours, the *Fancy* has been upon the *Hunt*, as sick Fancies generally are, for something out of the Way, and perhaps extravagant and hurtful; and when such Humours are sent in Plenty upon the *Stomach*, they are by the Heat of the Part rarefied into those *Flatulencies* which are vulgarly called *Wind*; which by distending the *Stomach* hinder the Folds of the inward *nervous Membrane* from approaching one another, and so destroy natural *Appetite*, as they do *Digestion* likewise by hindering the *Stomach* from closing exactly upon the Aliments, and so obstructing it in its Office, which requires that *Stricture*.

The same Way it is that hard Drinking destroys *Appetite* and *Digestion*; for by keeping the *Stomach* constantly distended with Liquor, the *Tone* of it is destroy'd, and till it can be recover'd again, they never return. We might by the same Way account for all the other Diseases of the *Stomach* in which *Appetite* or *Digestion* are affected; but to do that, would take up more Room than the Designs of this Work allow.

In what Manner the Contraction of the Fibrils of the Heart is performed; as also of the contractive Motion of the Muscles in general. From Mayow, &c.

WE have hitherto treated of the moving Particles by which the Contraction of the Muscles is performed, it remains still to be inquired into after what Manner the Muscles are contracted by them.

That Way of the Contraction of the Muscles by the Inflation of the Fibres, which has been asserted by some, I can't adn it of for Reasons alledg'd before. Unto which we may add also, that the Fibrils, which (according to our Opinion) do chiefly suffer this Contraction, seem to be solid Bo-

dies, and consequently not capable of Inflation.

In reference to the Contraction of the Fibrils, as far as I have been able to learn by Anatomical Observations, and my own Conjectures, they seem to suffer a Contortion in their Contraction. Certain it is, that this Manner of the Contraction of the Fibrils by Contortion is altogether agreeable to the Constriction and Hardness that is observed in the contracted Muscles. Besides that, this Contortion of the Fibrils is most suitable to that strong Traction of the Muscles

cles which sometimes is made with an almost surprizing Violence. Unto this we may add also, that the Motion of the nitro-aerious Particles, by which (according to our Opinion) the muscular Contraction is effected, is such as is most suitable or adapted to the Contortion of the Muscles; as may be seen (I suppose) by the following Experiment:

Take a small String, such as they use on Musical Instruments, and with both your Hands at some small Space from each other hold it so near unto a lighted Candle that it may be very hot, but not burn; which done, you will find the said String, as soon as it begins to be heated by the Candle, to contract it self very sensibly and strongly; which Contraction of this String is not effected after the common Way, but seems as if it enter'd upon a spontaneous Motion, and contracted it self after the same Manner as the Fibrils do, being a very delightful Sight to behold; and so soon as the String thus contracted is removed from the Candle, it is very easy to be drawn out again to its former Extent or Length.

As to the Cause from whence this Contraction of the Musical String proceeds, we may be fully perswaded, that the nitro-aerious Particles which break forth from the Flame of the Candle produce this Contraction of the String; for we have shewn in another Place, that all the fiery Particles by which the aforesaid String is contracted, are nothing else than the nitro-aerious Particles put in Motion; so that this Contraction of the String seems to owe its Rise to this, that it suffers a Contortion from the nitro-aerious Particles. For if you let one End of the String quite loose, or keep it only loosely betwixt your Fingers as before said, and so put it near to the lighted Candle, you will see the said String turn round with a swift Motion; viz. the nitro-aerious Particles that come out of the Candle, and that with a Motion of Circumrotation, such as is proper to their own Nature, entering into the String, do also produce there the like Motion of Circumrotation and Contortion.

It seems highly probable that the Contraction of the Fibrils is made very near after the same Manner; for the Fibrils, in which the Contraction is chiefly made, seem (as far

as may be discover'd by the Help of a Microscope) to be very like unto a very small String of a Musical Instrument; so that the Contraction of the Fibrils must be suppos'd to be perform'd by the nitro-aerious Particles put in Motion, and into an Effervescency in the Parts that are to be moved.

For if we see a rude and thick Musical String suffer a Contraction so soon as the nitro-aerious Particles do enter it, how much more probable is it that the very small Fibrils, which are of so artificial a Texture, should follow the Motion of the nitro-aerious Particles? Add to this, that when a Muscle is contracted, it is not to be reduced to its former Extent without something of Violence, just as we observ'd it before in the Musical String, which is the Reason why in the Paralysis of a Muscle its Antagonist is most commonly affected with a *Spasmus*; for a Muscle, when once contracted, would certainly remain in that Station or Position for ever, were it not for the Traction of its Antagonist, by Means of which it is restored to its former Length.

From this *Hypothesis* of ours, we may easily account for what is observed sometimes in the Parts to be moved when they are Thunder-struck, viz. That they will be convulsive and stiff, when at the same Time the Skin that surrounds the Muscles is generally not impaired.

For as I have endeavour'd to shew before, that the nitro-aerious Particles that are in the Brain, not only but also in the moveable Parts, are sometimes as it were set on Fire by a Thunder stroke; and these nitro-aerious Particles being put in a most swift and Fire-like Motion, do produce so violent a Contortion and Convulsion in the Fibrils, that they can't extend any more, but will always remain rigid; much after the same Manner, as it would happen to the fore said Musical String if it were put too near to the Flame of the Candle.

Of the Motion of the Muscles in their Contraction.

HAVING thus far treated of the Manner of the muscular Contraction, it remains

remains still for us to enter into an Enquiry also concerning the Motion of the Muscles, together with the Parts united to them when they contract themselves; of which, that you may have the clearer an Idea, take first the following Assertions.

First then we assert, That if a String which is loose at both Ends suffers an equal Contraction, then both its Ends will draw towards the Middle.

Secondly, That in case one of the Ends of the Musical String that is to be contracted is loose, and the other fasten'd to something, that End not only which is loose, but also all the other Parts of the said String, will be contracted towards that End that is fast, as may be seen in *Fig. 8. Tab. 81.* which represents a String thus fasten'd and contracted. For in the said Figure not only the loose End of the String *e.* but also the middle Part *a.* and for the same Reason likewise all the other Parts, will be drawn in the Contraction of the String towards its other End *b.* which must be supposed to be fix'd or fasten'd to something. And for the same Reason, if a greater Weight be put to one End and a lesser on the other, the less Weight will in the Contraction of the String be drawn towards the greater as to a fix'd End.

From what has been said, it will prove no very hard Task to conceive or comprehend the Motion of the Muscles, and of the abbreviated Fibrils, *viz.* If a Fibre, a Fibril, or a Muscle, both Ends or Extremities of which are loose, do contract themselves, there is not the least Doubt, but that both their Extremities will draw nearer to the Middle: But in case one of their Extremities is fix'd to some immoveable Part, as it is in those Muscles that serve for local Motions, this Contraction will tend towards the Part that is fix'd; and the moveable Extremity, which is called the *End* in a Muscle, towards the immoveable Extremity, or, which is the same Thing, towards the *Head* of the Muscle. And the same takes Place also in the Contractions of the Fibres or of the Fibrils.

I am not ignorant that the Learned Doctor *Willis* (in his Exercitation of muscular Motion) is of a contrary Opinion, and positive-

ly denies the Contraction of the Fibres from their End towards their Beginning; but agrees, that when they are shorten'd, both their Ends draw towards the Middle: But considering, that one Extremity of the *Fibre* is fix'd to a Tendon that is immoveable, it seems to me, that of Necessity the moveable Extremity of the contracted Fibre, as likewise its Middle, must be drawn towards that Extremity or End that is immoveable; as has been shewn just now.

Concerning therefore the Contraction of the Fibres, Fibrils, and Muscles, it is my Opinion, that they do not contract themselves rather towards their Beginning than towards their Ends out of their own Nature, but for no other Reason than because that Extremity which is call'd the Beginning is inserted into an immoveable Part; so that if a Bone into which the *End* of the Muscle is inserted does prove more or better fix'd than that wherein its Beginning is fasten'd, then the Muscle in its Contraction would be drawn towards that End that is thus best fix'd. As for Instance:

Take hold with one of your Hands of something that is immoveable, so as to cause a strong Contraction in the Muscles that bend the Cubit, (which may be effected if you endeavour to pull the Thing you have taken hold of towards you with your utmost Strength;) in this Case I say, since the Thing that is taken hold of, being immoveable, can't be pull'd to him that draws or pulls, the aforesaid Muscles, which in their Contraction attract the Arm, will also draw the whole Body that adheres to it towards the Thing that was taken hold of, so that these Muscles in their Contraction happen to be drawn towards their End, and not to their Beginning, because the *Os Cubiti*, into which the Ends of the aforesaid Muscles are inserted, is now the End that is most fix'd or fasten'd, because the Thing that is taken hold of is immoveable; as may be seen in the 16th Figure of *Tab. 81.* in which, whilst the Muscles that bend the Cubit, *a, c.* are contracting themselves, these don't bend the Cubit as they used to do, but the Arm; so that when the same are contracted, *b, c.* they are drawn towards the End *c.*

As to what relates to the Motions of the *Sphincters*, as also of the membranous Bodies, viz. the Motion of which is termina-

ted within themselves, these are in their Contraction drawn towards the Center of that Part which they inclose.

C H A P. VII.

Of the Contraction of the Septum transversum; of the Pulsation of the Heart, as also of its Palpitation; and of the Motion of the Animals when they arise upwards.

IN the preceding Chapter we have spoken concerning the Motion of the Muscles when they contract themselves in general, and of the Muscles designed for the Inflexion of the Parts in particular. The next Thing that is now to fall under our Consideration is, in what Manner the *Diaphragma* is moved in its Contraction, as also how the Pulsation of the Heart comes to pass; and lastly, how the Muscles intended for the Extension of the Parts do contract themselves, which Contraction produces what we call Leaping.

In relation especially to the Contraction of the *Septum transversum*, though we have treated of it in our Treatise of Respiration, published some Time ago, it will nevertheless be requisite to add some Things to it in this Place.

And here the first Thing I assert is, that whenever a sinuous or concave Surface, the Circumference of which is fasten'd to some immoveable Part, suffers a Contraction, it will every where be drawn towards the immoveable Part, and the concave Surface will approach towards the Plan, but never beyond it; as may be seen in *Fig. 9. Tab. 81.* in which let the sinuous Surface be *b, a, c.* the Ends *b, c.* of which are fix'd, when it is contracted, it will be drawn towards the Plan *b, e, c.* Now let the Surface be contracted *b, d, c.* its Middle *d.* I say, does approach nearer to the Ends *b.* and *c.* as the Middle of the Surface that is not contracted *a.* However, this Surface, even when contracted, will never go beyond the Plan *b, e, c.* because the Line *b, e, c.* is the shortest betwixt the Ends *b, c.*

According to this Position, we assert, that the *Septum transversum* in its Contraction is

carried towards a Plan, and that in its Constriction it tends towards the Cavity of the *Abdomen*, i. e. downwards and outwards; for it is apparent by Anatomical Observations, that the Figure of the *Septum transversum* is sinuous, so that its concave Surface or Sinus looks towards the *Hypochondria*.

Now it being certain that every concave Surface is moved in its Contraction towards a Plan, i. e. towards that Part to which its concave Surface looks; and since the Parts of the *Abdomen* unto which the concave Surface of the *Septum transversum* is turned, are in respect to the *Septum* placed in the inferior and exterior Part, whilst the *Septum transversum* is in its Contraction drawn towards them, it must of Necessity follow, that when it is contracted, it goes downwards and outwards; which is consonant also to the Observations made in the Dissections of living Creatures.

And here I can't but admire what could move the Learned *Willis* to assert in his Answer to Dr. *Higmore*, 'That the *Septum transversum* did sometimes, viz. in great and strong Inspirations, such as he supposes to happen in dying Persons, does descend below the Plan, and become very convex towards the Intestines.'

This seems to carry but little Probability along with it; nay, I do not see any Possibility how this Descension of the *Septum transversum*, occasioned by the Lungs, and a longer Inspiration, should come about as this Learned Man would have it, since the Inspiration and Intumescency of the Lungs is brought about by the Descension of the *Diaphragm* and the Dilatation of the Breast; whereas the Lungs never make the *Septum transversum* to descend, but follow its Mo-

tion; as has been shewn by us likewise in another Place. But the *Septum transversum*, when it contracts it self, is reduced to a Plan, and never recedes from it; as is manifest from what has been said just now.

It can't indeed be denied, but that sometimes in the Wounds of the Breast, or of the *Septum transversum*, the *Diaphragm* will be made uneven towards the inferior Parts; but this does not proceed from the Inspiration, nor from the Lungs, and their long Inspiration, but happens only in the Contraction of the Breast, and in Expiration: *viz.*

In the Dilatation of the Breast, where there is an Aperture made by the Wound, the Air enters partly by the *Trachea* into the Lungs, and partly thro' the Orifice of the Wound into the Cavity of the Breast by its elastick Force. Now when in Expiration the Space of the *Thorax* is straighten'd on a sudden, the Air which is inclosed in that Cavity that is betwixt the Lungs and the interior Side of the Breast, not being able to make its Passage immediately out of the Aperture of the Wound, and at the same Time suffering a Compression by the Contraction of the Breast, does protrude the *Septum transversum*, which is then already in a *Diastole* and relaxed, and pressing it downwards, produces its Convexity; as I can testify it by my own ocular Experience in the Dissections of living Creatures.

'Tis further observable in relation to the *Septum transversum*, that the fleshy Fibres taking their Rise from its membranous middle Part, do divaricate all round about from thence into those Parts into which it is inserted: Hence it is, that whilst some of the Fibres are extended from one Part, and others of the contrary Side, and cause an equal Endeavour towards a Constriction, the intermediate Membrane is kept in an equal Ballance; but in the mean while the *Diaphragma* is carried downwards and outwards no otherwise than if it had its Fibres extended according to its whole Length.

Of the Pulsation of the Heart.

As to what relates to the Contraction of the Heart, the most Ingenious Dr. *Lower* has given so exact a Description of its Mo-

tion and Structure, that scarce any Thing can be added to it. That the Heart is actually a Muscle, and that its Fibres when contracted do draw together or straighten its Ventracles, and thus expel the Blood, is what is manifest beyond all Contradiction.

But there is nevertheless a certain difficult Point to be solv'd, *viz.* How, since the Heart in its *Systole* suffers a Constriction and is straighten'd, it comes to pass that at the same Time it strikes against the left Side of the Breast? For it seems as if the Heart in its Contraction did rather go inwards, and recede further from the Breast.

'Tis upon this Account that some are apt to imagine, that it is not the Heart it self, but the great Artery, which when distended with the Blood strikes against the Breast: But the great Artery immediately after its Origination is carried backwards toward the Spine, so that its Pulsation can't be perceiv'd on the Outside. Neither must we imagine, that the *Auricula* of the Heart are what in their Contraction strike against the Breast, because these, as well as the Heart it self, are contracted straighter together in their *Systole*; besides, that their Situation, which is somewhat deep, is not so well adapted for striking against the Breast.

Neither ought it to be imagined, that the Tip of the Heart does by its Vibration and *Subsaltus* strike against the *Thorax*, and produce a Pulsation there; because I my self have made this Observation in the Dissections of living Animals, that the Pulsation of the Heart proceeds from its Ventracles being raised up into a Tumour: For if you open the *Thorax* of a Dog with all possible Dispatch, and put your Finger or Hand upon the left Ventricle of the Heart whilst it is in its *Systole*, you will see the said Ventricle to tumefy with a Kind of a Leap, and strike very strongly against your Fingers or Hand that have been laid upon it. Nay, if you put your Finger at some Distance from the left Ventricle whilst the Heart is contracting it self, you will find the Side of the same Ventricle to strike hard against your Finger; and that this happens thus, has been long ago observed by *Harvey* and *Lower*, our Countrymen.

The Ingenious Dr. *Harvey* is of Opinion, that this Pulsation of the Heart owes its Origine to this, that whilst the Sides of the Ventricles are contracted in Length, they must of Necessity increase in Thickness, just as it happens to the rest of the Muscles, which when contracted swell or grow bigger in Breadth.

'Tis true, I must confess, that the Sides of the Ventricles of the Heart do increase a little in Thickness in their Contraction; but it seems not very probable that they do swell up to such a Bigness as is required for the Pulsation against the Breast, it having been found of late, that the Muscles in their Contraction do not swell up so much as has been generally believed they did.

'Tis therefore my Opinion in relation to the Pulsation of the Heart, *viz.* That in the Constriction of the Fibres of the Heart they draw its *Cone* towards its *Basu*, this being the End or Extremity which is most fix'd and firm; whence it is, that the Sides of the Ventricles (with the Concurrence of the Pressure of the Blood contained within) must be pushed or carried outwards.

And here it is obvious to object with the most Ingenious Dr. *Harvey*, *viz.* That a circular Fibre in its Contraction will tend towards a right Line, but not towards a Circle; and that the Ventricles of the Heart being in a circular Position, they must of Necessity be drawn not outwards, but inwards towards a straight Line.

But unto this it is answer'd, That if both the Extremities of a circular Fibre are fix'd or fasten'd to something, then it will, when it is shorten'd, be carried towards a straight Position: But in case one of the Ends of the said Fibre is moveable, and actually in Motion, then it may be distended circularly in its Contraction. As for Instance:

In *Fig. 13. Tab. 81.* let *a, i, b.* be the circular Fibre or the interior Side of the left Ventricle of the Heart, and *a, e.* the *Septum* or Partition of the Heart; since (I say) in the Contraction of the Side *a, b.* one of its Ends *b. viz.* the *Cone* of the Heart, by reason of the *Septum a, e.* which is contracted also, does tend or bend towards *e.* that Side will by reason of its Contraction be carried outwards near *d.* and will make the Line

a, d, e. which though it be shorter than the Line *a, i, b.* yet will it rise into a Tumour near *d.*

Towards the Motion of that Side the Impulse of the Blood does also contribute a considerable Share; for this suffering a strong Compression by the Contraction of the Heart, and yet not being all protruded at once into the great Artery, it strikes with an Impetuosity against the Side of the Ventricle.

Here arises another Question, *viz.* How the Blood, that is contained within that Part of the Ventricle where the Contact is, is expelled? For it is not to be imagined, that in the *Systole* of the Heart the lowermost Part of the Heart does come close to the *Basu*, but that there is some Space or Interval left betwixt them.

Unto this it is answer'd, That it is uncertain as yet whether all the Blood does break forth every where from the contracted Ventricles; and it seems, that when the Ventricles of the Heart are depleted in a Manner or very near of all the Blood, the Remainder of the Blood can't be so closely or with so sufficient Force compress'd by them, as is required for the Protrusion of the Blood to its Extremities.

But if it be supposed that all the Blood is expelled from the Ventricles of the Heart, we must imagine that the Sides of the Ventricles do continue their Contraction for some Time after that first impetuous Impulse which produces its Pulsation; for it is next to an Impossibility to conceive how, without such a Continuation, all the Blood should by one Pulsation of a Moment be propelled into the great Artery.

Add to this, that in the Hearts of Animals when at the Point of Death, it has been found in Anatomical Dissections, that the Motion of Contraction is not made at one Stroke as it were, but that it begins in the *Septum*, and after that is gradually propagated in the *Latera* or Sides of the Ventricles; *viz.* in order to set the Blood first in Motion, there is a much greater Contraction, and a Shock or *Subsultus* required; whereas a much less Degree of a Constriction of the Ventricles is sufficient for its Continuation.

For the farther Expulsion of the Blood out of the Heart, its *Septum* and *Ventricles* are not only contracted in their Length, but in their Breadth also; for those *Scrobiculi* or Pits, which make up the Cavity of the Heart, have such a Position as are altogether adapted to the Heart when in a State of Constriction in all its Parts, as Doctor *Lower* has very well observed. Add unto this, that the Fibres of the Heart are annex'd all round about unto the Orifice of the Artery; whence it is, that when they are contracted they must distend the Sides of the Orifices on all Sides, and consequently open a free Passage for the Blood to discharge it self after its first Eruption.

Neither must it be pass'd by in Silence here, that the *Septum* of the Heart is not extended streight lengthways, but plac'd in an oblique Position, so that towards the Right Side it is somewhat raised or convex; but where it looks towards the Left Ventricle it is concave, or at least even, as you see it represented in *Fig. 3. Tab. 81.*

This Figure or Position of the *Septum* does not a little conduce towards the Ejaculation of the Blood with the greater Force out of the Left Ventricle of the Heart into the most extrem Parts of the Body; for by the Constriction of the Side of the Right Ventricle, the Blood which suffers a Compression by it, is forced against the convex Side of the *Septum*; and the *Septum* being in a Constriction, by its own Strength is tending towards a streight Line, and so produces still a greater Coarctation in the Left Ventricle, as may be seen in *Fig 13. Tab. 81.* so that even the Force of the Right Ventricle's Constriction does contribute not a little towards the aforesaid Contraction of the Left Ventricle.

'Tis farther observable, that whilst the *Septum* in its Contraction is thus drawn towards a Plan, almost the whole Heart is carried towards the Left Side, as is to be seen in the foresaid Figure.

Now considering that the Heart, after it is once put in Motion, does, according to the Nature of all Things that are projected, continue for some Time in that Motion; hence it is, that when it is carried towards the Left, it strikes with some Force against the

Left Side of the Breast; tho' after all I think, that the Thickness of the Side of the Left *Ventricle*, which exceeds that of the other, its stronger Pulsation, as likewise its Figure, which is very different from that of the right *Ventricle*, do not a little contribute to this Pulsation. Unto which it may be added also, that the spiral Fibres are disposed after such a Manner in the Walls or Sides of the Left Ventricle, that by any strong Constriction of theirs, the Heart is contorted so as that its Right Ventricle is bent a little backwards towards the Spine, and its Left forwards towards the Breast, where it strikes against it.

From what has been said it follows, that when the Passage of the Blood out of the Ventricles of the Heart is interrupted by some Obstruction, either in the sanguiferous Vessels of the Lungs, or else of the great Artery, it must of Necessity happen, that whilst the Heart does forcibly contract it self, to discharge it self as much as possibly it can of the Blood, the Sides of the *Ventricles* are by the Blood detained within distended into a circular Figure; whence it is that the Heart does strike with Violence against the *Thorax*, and that to such Degree at certain Times, that the very Ribs are protruded outwards by the said excessive Diverberations.

So that it is here we must look for the Cause of the Palpitations or Leapings of the Heart, especially of such as are of any long Continuance; for in this Affection, tho' the Pulsation of the Heart is very violent, yet the Pulse of the Arteries is commonly very slender in the Wrists; as has been found frequently both by others and my own Observations.

Unto this may be added and referred unto likewise, that when the Bodies of such Persons as have dy'd of the Palpitation of the Heart have been open'd, sometimes the sanguiferous Vessels of the Lungs, sometimes the great Artery, have been found obstructed, or perhaps quite stop'd up, either with some cartilaginous Body growing to it, or by some coagulated Blood; and one of the *Ventricles* of the Heart much distended by some grumous Blood.

For the better Satisfaction of the Reader in relation to what has been said upon this Head, we will insert here what has been observed by the learned and most ingenious Doctor *Tho. Millington*, and communicated to me not long ago by him, relating to this Affection, and is as follows:

A young Gentleman of about 20 Years of Age, of a lean and very tender Constitution of Body, had been affected for some Years past with a Palpitation of the Heart, which was so violent, that the Ribs were thrust outwards by the Pulsation of the Heart against them, and there appear'd a very considerable Swelling on the Left Side of his Breast, unto which if you laid your Hand, you might have felt the Heart striking with Violence against the *Thorax* in such a Manner, that it seem'd as if you might grasp it with your Hand. All this while the Pulse in the Arteries of the Wrists was very low. That these Things were thus far actually observable in this Patient, after the same Manner as they have been related, I am able to testify my self.

Besides this, the Patient, whenever he did run or move faster than ordinary, was short breathed, and affected with a most violent Palpitation of the Heart, and was almost ready to fall into a Swoon for Want of Spirits.

At last, after having travell'd a great Way in a Coach, he was seized with a more violent Paroxysm, attended with frequent swooning Fits, and a Coldness in its Extremities or Limbs, and so died.

His Body being open'd, the Heart was found very much swell'd, but more especially its Right Ventricle, which was bigger than ordinary, and turgid with coagulated Blood; besides, that its muscular Side was very robust and thick. Besides this, the Pulmonary Artery and Vein were distended with a grumous Blood; and the Vein, whereby it discharged it self into the Left Ventricle of the Heart, was almost closed up by a Cartilage that was grown to the Inside of it, so that the Blood could scarce penetrate into that Ventricle.

And that this Obstruction of the *Vena Pulmonalis* was not only the Cause of the Palpitation of the Heart, but of all the before-said Phenomena wherewith this Patient

was afflicted, is, I think, beyond all Dispute.

For considering that the Blood could not by reason of this Obstruction enter into the Left Ventricle of the Heart, there was a Necessity for the sanguiferous Vessels of the Lungs, and the Right Ventricle of the Heart being distended by the Blood; and there was also no less a Necessity for a violent Constriction of the Heart, but more especially of the said Ventricle, in order to propel this Blood as much as possibly could be through the Lungs into the Left Ventricle of the Heart.

This was the Reason also why the Side of the Right Ventricle proved so strong and thick, because all Muscles will increase in Bulk above the rest by violent Exercise.

The Reason why the Heart should strike with its violent Pulsation against the Left Side of the Breast, whereas the Tumefaction appeared only in the Right Ventricle of the Heart, must be accounted for thus; viz. Considering that all the Blood could not be expell'd out of the Right Ventricle, by reason of the fore-said Obstruction, and suffering a very violent Compression by the violent Constriction of the muscular Side of the Ventricle, the *Septum* of the Heart, and consequently also the Heart it self, was propelled towards the Left Side, as has been shewn before.

But here it is to be observed by the by, that the Palpitation of the Heart, which comes on a sudden and unforeseen, may owe its Cause also to this, That upon any overheating of the Blood, when it is put into too violent a Motion, it rushes with too rapid a Current into the Ventricles of the Heart; so that the Heart is under a Necessity for the Expulsion and Discharge of this extraordinary Affluence of the Blood, to make also a more extraordinary Constriction.

It ought also to be remember'd in this Place, that the Heart, as well as all the other Muscles, being subject to convulsive Motions, its Palpitation may sometimes be attributed also to that Cause.

But as to what relates to the Difficulty of Respiration, wherewith this Patient used to be affected at all Times upon any extraordinary

nary Motion or Exercise, this must be deduced from thence, that the Blood which by the Contraction of the Muscles was carried with a more plentiful Stream to the Right Ventricle of the Heart, found it self interrupted in its free Course through the Lungs, and into the Left Ventricle of the Heart.

By saying this, I would nevertheless not be understood thus; as if it were my Opinion, that the Blood detained in the Lungs did so far stop them up as not to afford a free Passage to the Air: For let the sanguiferous Vessels of the Lungs be never so much distended with Blood or any other Liquid, the Lungs themselves will never swell bigger; but nevertheless are expanded or extended by the Air that is drawn into them, and when that is gone again, they soon decrease again.

This every one may be convinc'd of, by making an Experiment in the dead Body of any Animal, by conveying some Blood or other Liquor into the *Vena Pulmonalis*, after a Ligature made upon the *Arteria Pulmonalis*, and then blowing the Air into the Lungs by the Help of a Pair of Bellows apply'd to the *Aspera Arteria*.

But whenever the Blood does stagnate in the Vessels of the Lungs, the Patient will be the same as if Respiration were suppress'd, for there are chiefly two Things proceeding from Respiration:

First to convey the Mass of Blood through the Lungs into the Left Ventricle of the Heart; (tho' this is not so much owing to the Motion of the Lungs as to the nitro-aerious Particles, which being intermix'd with the Blood by Respiration, ferment the Blood, and keep it from coagulating, as has been shewn elsewhere.) And therefore if the Blood does upon any Account or Reason stagnate in the Lungs, as it happen'd in the before-mentioned Case, the Patient labours immediately under Difficulty of Breathing, and is in a Manner suffocated.

The *Second* Effect of Respiration is, that the nitro-aerious Particles may be together with the Blood carried in a sufficient Quantity to the Brain, in order to give a fresh Supply of the animal Spirits, which unless it be done in due Measure and Order, the Second Respiration of the Brain being sup-

press'd, there will soon ensue a great Defect of the Spirits, and frequent Swoonings.

In what Manner the Action of Leaping is perform'd.

BY Way of Appendix, we will add something here also concerning that Motion, by which the Animals do raise themselves altogether from the Ground in Leaping.

This Motion, according to the most ingenious Doctor *Willis*, is not owing to the Contraction of the Muscles, but rather proceeds from some elastick Vertue; for these are the Words of this learned Man in his Answer to Doctor *Higmore*.

' In case there were no other Attraction
' but to the Part that is immoveable, How
' would it be possible for an Animal to
' move it self altogether, and to lift it self
' at once from the Ground, for the Motion
' of the Whole does follow the Motion of
' each of the moving Parts; and therefore
' if these can only be drawn one to another,
' and can lift themselves wholly up, with-
' out any elastick Vertue, I am then willing
' to own, that I am not able to comprehend
' by what Means, and by what Contrivances, an Animal can raise it self up
' from the Ground, and leap up and down
' from Place to Place.

But for my Part I am as little able to comprehend what this learned Man means by the elastick Vertue of the Organs; neither do I see any Reason why we should have Recourse to it, since that Motion of the Animals by which they may raise themselves from the Ground, may be very conveniently made by the Contraction of the extending Muscles; as will be apparent from what follows.

Let, in the *Fig. 10. Tab. 81.* there be a Stick, *a, b*, which must be suppos'd to be turn'd round its Center *a*; now I say, that every Part of this Stick thus turn'd round, viz. *c, b*, will be ready to decline as much as in them lies from the Centers of the Circles describ'd by themselves, and will move towards the streight Lines *ce*, and *be*; for here the Thing is the same as what may be ob-

observ'd in a Stone turn'd about in a Sling, which is inclin'd always to slip out of the Sling, and to enter upon its Motion in a straight Line, as it has been long ago observ'd by the most ingenious Monsieur *Des Cartes*.

Now let us suppose the same Stick that is turn'd round, whilst plac'd in an horizontal Situation, to be loose from its Center *a*, you will then find him not to go on in a circular Motion, but to ascend directly upwards.

Now this being granted, let, as in *Fig. 2. Tab. 81. a, c*, be the *Os Tibiæ*, and *c, n*, the *Os Cruris*, and *e, b, c*, the *Musculi Extensores Tibiæ*; now when these are contracted, and the Animal put beforehand in a convenient Position for Leaping, the *Os Cruris, c, n*, will be turn'd round the Protuberancy of the *Os Tibiæ* near *e*, in the same Manner as the before said Stick round its Center.

So that the *Os Cruris*, or Thigh-Bone, when thus turn'd round and tending to move upwards, if it be turn'd about with a sufficient Impulse or Strength by the fore-said Muscles, this Endeavour will take Effect, and the Thigh Bone will pull the *Os Tibiæ* along with it upwards. In the same Manner it is with the *Musculi Extensores* of the Foot, Back, &c. by the strong Contraction of which, the Parts into which they are inserted are turn'd round and carried upwards.

Thus you may see in *Fig. 12. Tab. 81.* which represents to you the Muscles Extensors of the Foot, Leg, Thigh and Back, together with the Bones into which they have their Insertions. The Reason why we have in the same Figure given you a Delineation also of the bending Muscles of the Arm, Cubit and Hand, is, because these Muscles also contribute their Share towards this Elevation of our whole Body; viz. as far as they, being violently contracted, do pull with some Force the Parts annex'd unto them upwards, as every one may find in himself when he goes to leap.

But here it is to be observ'd, that the before said Bones, together with the Parts annex'd unto them, are not by the Contraction of the said Muscles pull'd directly upwards,

but that the Parts belonging to the Thigh are rais'd upwards and forwards, and the Parts of the Back on the contrary upwards and backwards, as may be seen in the fore-said Figure. This must however be taken thus; that in the Motion of the Animals, which raise themselves directly upwards, the same Force or Impulse by which some Parts are tending forwards, and that by which the rest are carried backwards, being fix'd in an *Equilibrium*, do mutually check each other; and in the mean while diminishes the other Motion, by which all the Parts are rais'd upwards, and according as the Animals leap forwards or backwards, this Force, which draws some of the Parts forwards, and others backwards, must be the most prevalent.

But to give you still a more clear Idea of the Matter, I say that the before said *Musculi Extensores* do, by the Means of their Contraction, raise the Animal upwards, altogether after the same Manner as we see a Thing thrown out of our Hands to a Distance.

Now concerning the Force or Impression made upon those Things that are thrown to a Distance, we can't have any other Conception or Notion of it, than that it is one only Motion, into which after a Thing is once put, it will continue in the same for ever, till such Time that it is stop'd either by some Bodies that light or are in its Way, or else by its innate Gravity.

For in the same Manner (as the Great *Des Cartes* has very well observ'd) as when a Thing is in a State of Rest, we don't in the least imagine that it will ever begin to move, unless there be some Impulsion or Impression made upon it by some Cause or other; so there is not the least Reason to believe, that a Thing that is in Motion should ever cease or intermit its Motion of its own Accord, unless prevented by some Thing that is in its Way.

For considering that inanimate Beings are not in a Capacity to dispose of themselves, but are subject to the Disposal of others, there is a Necessity for their continuing in the same State in which they are plac'd for ever, until that State is alter'd by some external Cause or other.

Concerning that Impulse or Impression made upon a Stone cast out of a Sling, or a Bullet shot out of a Gun, we can frame no other Notion of them, than to be a most swift Motion, by which the Things that are thrown, or cast out, are under such a Constitution when they come forth out of the Sling, or out of the Gun.

To give you an Instance in relation to what has been said upon this Head: Let us suppose a *Pendulum* that is let down out of any Point of a Circle; whilst this does descend to the lowermost Part of the Circle, it does not rest there, but will ascend to the End of the Circle, very near at the same Height opposite to the other. Now pray what is it that makes the *Pendulum* to ascend thus? For as to the Gravity, that is unable to produce an Ascent in its own Nature, which on the contrary endeavours to make Things descend; and yet at the same Time in this Case the Gravity of the *Pendulum* is the real Cause which makes it ascend; *viz.* in so far as the *Pendulum*, when brought to the lowermost Point of the Circle, by the continued Impulse of its Gravity, has acquired so quick a Motion, that it is able to raise it self upwards; for the higher the Point in Place is from whence the *Pendulum* is let down, the higher it will rise again at the opposite Part; which happens for no other Reason, but that the *Pendulum* being fallen down from a higher Place, has in the lowermost Point of the Circle obtained a much more swift Motion, and consequently also a much stronger Impulse or Impression.

It happens altogether after the same Manner, with a Bullet when it comes out of a

Gun that is pretty long, by which it acquires a very quick Motion, and consequently also a very strong Impression or Impulse.

For the quick Motion, or the Impulse and Impression made upon a Stone thrown or falling from off a high Place, or of a Bullet shot out of a long Gun, are increased by one and the same Cause; *viz.* because whilst the Stone is descending, or the Bullet passes through the Barrel of the Gun, the Impulse of Gravity, or of the impelling Force, is removed at each Instant.

But to come to the Application of what has been said just to the present Question: When an Animal bends it self, in order to put it self into a proper Position for Leaping, (for we see that when an Animal is to leap, or raise it self upwards, it must of Necessity bend or inflect it self first) then the Muscles that extend the Members do all in general enter into a very violent Constriction; whence it is, that all the Parts of the Animal are carried upwards, as is evident from what has been said above.

And as all the Parts of the Animal, and consequently also the Animal it self, are by the foresaid Muscles put into a Motion to rise upwards, these Muscles do by the same Manner raise the Animal on high or upwards, as Things that are thrown out are moved somewhere or other; for the Impression made upon Things projected, is nothing else than a Motion towards some certain determinated Place, towards which a certain Thing is cast by some impelling Cause.

Of Voluntary Motion, according to the System
of Borellus, Willis, Glisson, Harvey, and others.
Taken from Doctor Charlton's Enquiries into Hu-
mane Nature.

IN this illuminated Age of Experimental Philosophy, and Anatomick Knowledge, there have been many, who laying aside that *antique Hypothesis* of *Animal Spirits*, as both improbable and unnecessary, hold it to be sufficient to solve all the *Phænomena* of Voluntary Motion, if it be suppos'd that the Dictates of the Soul are transmitted from the Brain to the Nerve and Muscle to be us'd, not by Emission of any Substance whatsoever, but by a meer Contraction of such *Fibres* of the Brain as are continued to them, at the other inserted into the Head of the Muscle, so as to make one continued Cord all along; if a Motion be excited *ad Nutum Animæ* in the *Fibres* of the Brain, the same must be at the same Time excited in the Nerve also and the Muscle, by reason of their *Continuity*.

The Ancients, 'tis well known, unanimously taught, that the Soul effects Motion in the Muscles at Pleasure, by transmitting from the Brain, by the Nerves, into them a certain most thin, most subtil, and most agil Substance, which they call therefore *Animal Spirits*, by whose swift and copious Influx the Muscles to be moved being in an Instant as it were inflated and distended *secundum Latitudinem*, they are forced to contract or shorten themselves *secundum Longitudinem*, and by that Contraction to pull and move the Members to which they are fasten'd. And this Opinion hath been without any Dispute embrac'd and asserted through a long Train of Ages down to this in which we live.

Betwixt these two so different and irreconcilable Opinions, I am forced to suspend my Judgment, says my Author, not

yet being able to discern which hath the Advantage above the other in Point of *Verisimilitude*. To reject either of them as *erroneous*, would hardly consist with the Rules of a Philosopher, who ought to weigh *Truth* as in a Ballance. There remains nothing then but to examine both, and after the Arguments are produc'd on both Sides, to give Sentence which of the two Opinions is the more probable. Out of Deference to Antiquity, we shall begin with the Opinion of the Ancients, and first of all defend the *Hypothesis* of *Animal Spirits*.

In the first Place therefore, seeing every Instrument ought to be accommodated both to the Nature and Force of the Agent that is to use it, so as to hold some Proportion to the Energy of the one, and to the Conditions of the other; and seeing that *Voluntary Motion* is commanded and executed in one and the same Moment of Time, with Velocity equal to that of Lightning: Considering this, it seems necessary that the Instrument upon which the Soul immediately impresses her Power, should be such as is naturally fit to convey the same from the Brain, by the Nerves, into the Muscles, *tanquam in instanti*, and most easily. But in the whole Body nothing is found so easily and swiftly moveable, as that most subtle and meteoris'd Substance of which the *Spirits Animal* are suppos'd to consist; and therefore it is consentaneous that they are the immediate Instrument of the Soul in Voluntary Motion.

Here it may be objected, That although these *Spirits* be suppos'd to consist of Matter the most refin'd and most agile imaginable, more subtil than the Particles of Light,

or *Des Cartes's Materia Subilis*; yet still they must be Bodies, and therefore can hold no conceivable Proportion to the *Soul*, which is believed to be *Incorporeal or Immaterial*. But tho' this Objection lies heavy on this Doctrine, it seems not to be much reliev'd upon the other *Hypothesis*, of the *Muscles* being mov'd by the *Nerves* excited or invigorated at their Original by Motion begun in the *Fibres* of the *Brain* by the *Soul*.

Secondly, It is evident that the motive Power of which we are speaking, is not inherent in the *Muscles* themselves, nor in the *Nerves* inserted into them, but deriv'd and emitted into them from the *Brain ad Nutum Anima*, as she has Occasion to use them. If so, what Notion can we have for such a Power, unless we conceive it to be a certain Invigoration or Force suddenly communicated to, or impress'd upon the *Fibres* of the *Muscles*? And wherein that Invigoration's to consist, if not in a Diltention of those *Fibres*, by some Influx from the *Brain*?

Thirdly, If there be no invigorating Influx from the *Brain* through the *Nerves*, How comes it that an Obstruction or Compression, of any one of them, forthwith causes a *Palsy* in that Part to which the obstructed or compress'd Nerve belongs? Is it not only from hence, that the Inter-course betwixt the *Brain* and *Muscles* of that Part is wholly stop'd? If the *Nerves* were design'd and fram'd by Nature to do the Office of *Strings* or *Cords* only, Why were they not made of one continued Substance, but of many slender Filaments or Threads? And why were not these small Threads closely twisted together into a strong Cord, but extended as *Parallels*, Side by Side, and intercepted with many narrow *Canals* or Passages betwixt them, and all inclos'd within a membranous Coat extremely thin and slender? Certainly, if we attentively contemplate the Artifice of Nature, in the Figure and Contexture of a Nerve, we shall find our selves almost oblig'd to acknowledge, that the *Fibres* were so dispos'd in *Parallels*, with small *Canals* running along betwixt them, to give free and quick Passage to the subtle Influence to be transmitted from the *Brain* into the *Muscles*, for the invigorating of their *Fibres*. And *Galen* reflecting upon this, that if a Nerve

be cut asunder, the *Muscle* into which it was inserted becomes ever after incapable of being us'd to *Voluntary Motion*; from thence with great Assurance he concludes, *Nervi igitur, Rivorum in Morem, a Cerebro, cum ex quodam Fonte, deducunt Musculis Vires*: Where 'tis remarkable, that he compares the *Nerves*, not to *Strings* or *Cords*, but to *Rivulets* or *Conduit Pipes*, framed for the Conveyance of the invigorating Influence or first *Impetus* from the *Brain*, as from a *Fountain*. And what could he have said, either more intelligible in it self, or more favourable to the Doctrine of *Animal Spirits*?

Fourthly and Lastly, It is not unworthy Consideration, that the *Voluntary Motion* of *Reptiles*, such as *Earthworms*, *Snails*, and such like, is perform'd by the Help of a certain *Aerial* or *Spirituosus* Substance issuing from their Heads, discernable in *Snails* by the Sight. For if you put a large grey *Snail* into a clear Vial, and hold him up against a good Light, you may plainly perceive, that when he begins to creep, a Chain of little Bubbles will come from his Tail, and move along one after another to the Middle of his Back, and thence up to his Head. When the *Snail* remains quiet, the Motion of the Bubbles ceaseth; as he again begins to advance, they also begin their Course anew, passing by a Kind of slow *Circulation* from the *Tail* to the *Head* along the Back, and from the *Head* to the *Tail* along the Belly: So that it seems probable, that these Bubbles being protruded or procell'd in the Manner describ'd, are instrumental to the Motion of the *Snail's* fore Part, to which he after draws up his hinder Part, making an Arch in the Middle, and so advances.

Now tho' Nature be observ'd to diversify the Instruments of *Voluntary Motion* in various Sorts of living Creatures, according to the Diversity of their Bulks, Shapes, Functions and Necessities of Life; and therefore to infer a Parity of Contrivance of them in more perfect Animals, from an Observation of the Action of those in less perfect, would be but an inartificial Argument; yet for as much as she seldom varies her more general Ways of Formation but upon Necessity, and when she doth, her Deflections from her common Method are never so wide, but still they carry some Analogy to them:

It seems not improbable, that as the progressive Motion of Reptiles is perform'd by the Help of an *Aerial Substance*, so likewise our muscular Motion is made by the Help of a spirituous Influx from the Brain into the Nerves and Muscles.

This is the Sum of the principal Arguments urg'd, partly by the ancient and partly the modern *Defenders* of *Animal Spirits*, and of their necessary Use in *Voluntary Motion*: We shall next proceed to change the Argument, and plead both against their Existence and Use. *Physicians* indeed speak greatly of *Animal Spiritus*, as of the plenipotent and immediate Instrument of the Soul in all her Operations upon the Body. For what Disease of the Brain can you name, which hath not been attributed to their Vices, either to their Defect, or Excess; to their Stupidity and Sluggishness, or their Fury and Tumults; to their Interception, or too copious and impetuous Influx; to their Fixation, or incessant Exagitation; to their Depravation by exotique and inconvenient Mixtures; to their Dissipation by *Opiates* and *Narcoticks*; or to some other of a thousand Accidents to which they are suppos'd to be obnoxious. Nay, some have gone yet much further; and yet, after all our specious Discourses of these Emissaries of the Soul, *Animal Spirits*, we are distracted by various Opinions concerning them, still anxiously inquiring of what Matter, in what Place, and how they are generated; what are their Qualities, Motions, Ways and Manner of Acting; and in fine, uncertain whether they be real Creatures of Nature, or only the Idols of humane Imagination.

Some have affirm'd, that the *Fluid* contain'd in the Pores and Fibres of the Nerves, is the more subtil Part of the *Blood*, separated and sublim'd in the Brain, giving it the noble Name of *Spiritus*; but they have not yet by certain Reasons or Experiments taught us to which of all the Fluids that are known to us that is like. *Others* therefore proceeding somewhat farther, pronounce that these *Spirits* consist of *saline* and *sulphureous* Particles, highly analogous to the Spirits of Wine. But this is to feed our Curiosity with fine Words, that signify little of Certainty. True it is indeed, that

upon drinking a little Glass of Spirit of Wine, we find our Strength suddenly recruited; but whether from the *Humour* we call *Spirit*, or from that other Matter that makes that *Spirit fluid*, or is perhaps for some other Reason join'd to it, who hitherto has determined? Besides, the *Animal Spirits*, if any such there be, seem to be so far remote from the *Subtily*, *Acrimony*, and Volatility of Spirit of Wine, that we want not just Reasons to convince us they are not volatile, nor actually rarefied into Exhalations, nor acrimonious. Not volatile, because if they were such, certainly they would offend and trouble the Brain, as may be infer'd from the Lassitude, Headach, Giddiness, and other Symptoms that commonly invade Men next Morning after a Debauch with Wine, all which come from the volatile Spirits of the Wine. Not *Actual Exhalations*, because in that State being mix'd with other Humours of the Body, they would produce Bubbles or Froth, or cause also an Inflation of the Parts containing them, neither of which is to be endured. Not *Acrimonious*, pungent, or offensive by Asperity of their Particles, because if such, they would continually irritate, prick and corrode the Brain and Nerves, and necessarily force them into Convulsions, and other tumultuous Motions. We may add, that they are not, as *Sylvius* imagined, apt to ferment; because if such, they could not but fret and dissolve the soft and tender Substance of the Brain, &c.

By these and other Reasons induced, our most excellent *Glisson*, in his Treatise of the *Stomach* and *Intestines*, form'd his *Animal Spirits* of a Constitution exempt from all these inconvenient Qualities: He describes them to be *mild*, *placid*, *sedate*, *fix'd*, *sweet*, *nutritive*, *corroborating*, and apt to consolidate; and in all these Respects exactly like the Spirits contain'd in the *White* of an *Egg*. Their Subject he held to be the true *Succus Nutritivus*, distributed from the Brain thro' the Nerves to all spermatick Parts; which he would have to be generated only in the Brain, and that the Matter of which they are in that Manner generated, is the more mild and spermatick Part of the *Blood*, the acrimonious and more elaborated Part being reduced thence by the *Veins* for that

Purpose perhaps distributed into the *Cortex* of the *Brain*; concluding, that the select Part is changed into Animal Spirits, not by Sublimation, &c. but by Mitigation, Refrigeration, &c. so that in fine, if their Nature agree with this Character, I do not see by what Right they can be call'd Spirits, according to the common Notion Men have of all Things known by that Name.

Equally uncertain it is by what Kind of Motion these invisible Emissaries are transmitted from the Brain through the Nerves, whether they fly swiftly, or creep along slowly; for some there are, who, fond of the *Chimera's* of their own Imagination, have confidently taught, that these Spirits are not only moved most rapidly in the Brain and Nerves as Lightning is darted thro' the Air, but as it were shot out at the Command of the Fancy into the Nerves, and recalled again by the same Ways in an Instant, according to the Exigence of the Actions to be performed by them; and yet neither of these seem consonant to right Reason.

No Wonder then if Dr. *Glisson*, plainly discerning the Incongruity of this most rapid and reciprocal Motion attributed to the Animal Spirits, not only wholly rejected it, but thought of another plainly contrary thereunto; for he concludes, that the Spirits lodg'd in the *Succus Nutritius* are carried from the Brain through the Nerves by a Motion not impetuous or rapid, but gentler, slow and placid, imperceptible by the Sense, and tending only outward; as the nourishing Juice of Plants is believed to creep up from the Roots along by their *Fibres*, and that they do not immediately move the Muscles, but by recruiting their Vigour, and corroborating the Tone of their Fibres, render them able to execute their Offices promptly and strongly. He adds, that in all *Voluntary Motion*, the *Fibres* of the Muscles do by their own proper vital Motion abbreviate or contract themselves, needing no copious and sudden Afflux of Spirits, either Animal or Vital, to shorten them by Way of *Inflation*, and put them upon informing the Motions commanded by the Fancy.

Glisson supposes the Brain not only to have Power of moving it self at Pleasure, but what is yet more amusing, to be also the Principle of our Cogitations, of our Appe-

tite, and Animal Motion; which (says *Charlton*) I cannot well comprehend: For though it be granted, that the Medullary Substance of the Brain, however soft and tender to the Touch, may nevertheless, in respect of the small Fibres of which placed in Streaks it is composed, be capable of some Tension and Remission; yet do I not see by what Reason it can either think, desire, or move it self at Pleasure, in order to Voluntary Motion. But though we should grant the Brain a supposed *natural Perception*, with its inseparable Adjuncts; yet this would by no Means suffice to excite and cause *Animal* or *Voluntary Motion*, first in the *Fibrils* of the *Brain*, then in the *Nerves*, and after in the *Muscles*; because this Motion is far nobler than any Motion meerly spontaneous, and proceeds from and depends upon a Principle incomparably more sublime and *energetick*, namely the *Soul*. The other is this: How so small a Contraction of the *Fibrils* of the *Brain* in that Part which is moved by the Appetite, as he supposes not to exceed the Two hundredth Part of a Finger's Breadth, can suffice to make a much greater Contraction in the Nerve destined to perform the Action commanded? For since the *Fibrils* of the *Brain* are not only conjoined with the *Fibres* of the *Nerves* thence produced along to the *Tendons* of the *Muscles*, but so united also as to constitute so many little Strings or Cords continued from their Original to their Ends or Insertions; and since it is from Mechanick Experiments manifest, that all Cords, when pull'd or stretch'd at one End more or less, are equally extended all along quite Home to the other, and this is by reason of the Continuity of their Parts. Considering these two certain and evident Truths, I cannot conceive, how in the said little Cords of the *Brain* and *Nerves* any Contraction or Tension can be made that shall be in one of their Extremes at least Two hundred times less than in the other.

It is indeed among *Physico-Mathematicians* a mighty Controversy, Whether or no the Strings of a Lute, Viol, Harp, or any other Musical Instrument, when wound up, be equally stretch'd or strain'd in all their Parts? Because when they are strain'd above their Strength, they are for the most part broken at the Ends, rarely in any other Part; which

yet seems to happen only from hence, that the Strings are at both Ends weaken'd by winding up the Pegs, and being tied in a Knot, whereby their Coherence of Parts being violated, they must needs be more fragil there than in any other Part to which that Violence hath not extended. Nevertheless, that a Lute String stretch'd by a *Plummer* hung perpendicular at one End, and held by a Man's Finger at the other, is extended in all Parts alike, is beyond all Controversy; and that is sufficient; for from thence it is most evident, that howsoever, and in what Part soever, a Nerve is contracted, the Contraction must be equal in all Parts of it, not only a Hair's Breadth at one End; and two or three Inches perhaps at the other.

But perhaps the Sense of this Judicious Author is this: That even the least Invigoration of the Brain may suffice to excite a much greater Contraction in the Nerves, not so much by immediately contracting them, as by so affecting their Perception natural, that they may presently contract themselves by spontaneous Motion, and that so much as is sufficient to execute strenuously the Command of the Fancy. Admitting therefore this Interpretation of *Glisson's* Words, we might inquire, if that invigorating Vertue which he confers upon the Brain, consists only in the Tonick Motion of its Fibrils, to which the Fibres of the Nerves are continued; and if so, then whence it is that a greater and stronger Force or Vigoration is excited in the Threads of the Nerves, than in the Fibrils of the Brain that move them; or, whether also the so often mentioned Fibrils of the Brain have requisite Notice both of the Command given by the Fancy, and that it is their Office to put the same in Execution. Other Difficulties there are in this intricate Hypothesis not easy to solve, and therefore we shall not burthen the Reader with them.

Perhaps then we are equally uncertain, whether there be in *Rerum Natura* any such Thing as *Animal Spirits* of a distinct Species for the *Vital Spirits* or not. *Harvey* denies their Existence in his Book *de Generatione Animalium*. So did all the *Peripateticks* against *Galen*. So Sir *George Ent*, in his *Antidiatribe*, acknowledges no Spirits in the Animal but what proceed from the Heat of the Blood;

and *Glisson* is of the same Opinion. Indeed if a Man seriously and without Prejudice considers the Bulk, Temperament, various Parts and Texture of the Brain, he will at length find but little Reason to believe that Nature hath framed it for a Laboratory for the Spirits; for we are told, that these Spirits are made of the most subtil, most refined and volatilized Parts of the Arterial Blood by Way of Sublimation. But *Malpighius* himself, a most accurate Inquirer into the Structure of the Brain; hath after all his Microscopical Discoveries made this ingenuous Confession: *Ut Verum fatear, quo magis manifesta mihi elucescit Cerebri Structura, eo magis tot mirabilium Operationum explicandi Methodum Spes excidit. Simplicem tandem dum agnosco Cerebri Structuram, ineptum omnino ad exponenda Sensuum & tam nobilium Operationum Phenomena reor: Ita ut hoc tantum conicere possim, a Cerebri & Cerebelli Glandulis in continuatos Nervos separari Succum quendam, sicut in ceteris Glandulis proprio Vase excretorio dilatis, &c.*

To come then to a Conclusion of this Argument: From what hath been said, it sufficiently appears, that we are still in great Uncertainty not only of the Matter, Generation, Nature, Qualities and Motion of the Animal Spirits, but of their very Existence also: I shall therefore proceed to the *Instrumentum proximum sive ultimum* which immediately and sensibly performs the Act of Voluntary Motion. This all Men agree to be the Muscles, in which there occur three Things chiefly to be consider'd by Anatomists, viz. their common Constitution or Structure, their principal and sensible Differences, and the Reason by which they move the Parts to which they are affix'd; for these Things being duly explained, may perhaps bring us at length to such a Degree of Knowledge of the Manner of Voluntary Motion, as may, if not satisfy our Curiosity, yet at least advance the noblest of all our Intellectual Delights, the grateful Admiration of the infinite Wildom of our Creator.

Concerning the first therefore, it is obvious to every Man's Reason, that the immediate Organ of Voluntary Motion ought to be of such a Constitution as may render it apt both to receive Invigoration, that is, to be excited to Motion by the Brain, and to move the

Member or Part to which it is affix'd. It is manifest therefore, that a hard, inflexible, rigid and bony Substance is so far incompetent to both those Uses, that *Galen* affirm'd, that any Part casually becoming hard and stiff, though only from a Cicatrice or Scar, is thereby render'd unfit for Motion; and that consequently the Substance of a *Muscle* ought to be as Nature has made it, *soft, rare, flexible, extensible*, and furnished with great Store of *Fibres*.

It is also requisite, in respect of the Distance betwixt the Brain and the Muscle, that there should be some third Thing intermediate and continued to both, by which the first *Impetus* in the former may be communicated to the other, whether the Invigoration be affected by Influx of any Substance from the Brain, or by *Dr. Glisson's* Way formerly described; and the *Nerves* being the only Part of the whole Body qualified for this Use, Nature hath therefore prudently inserted one or more of them into each *Muscle*. Now these two Parts, *Flesh* and *Nerves*, are the principal Ingredients requisite to compleat the Essence of a Muscle; as may be inferr'd from hence, that there are some perfect Muscles, particularly those of the *Forehead*, the *Temples*, *Bladder*, *Fundament*, &c. in the Composition of which neither Tendon nor Ligament is to be found.

But because there is in some Parts to be moved, by reason of their greater Gravity, a greater Resistance to Motion than the meticulous *Flesh*, in respect of its Softness and Tenderness, is of it self able to overcome, chiefly in some Positions; therefore there ought to be an Addition of some stronger and tougher Substance, which being connected or united to the *Flesh* of the Muscle, may both corroborate the same, and more firmly conjoin it to the Bones, so as to enable it to overpower that Resistance. Hence it is, that some Muscles, especially such as are destined to bear great Stress in surmounting the Weight of great Members, or in strong Motions, are furnished with *Ligaments*, as well for their better Firmation to the Bones, as for Augmentation of their Strength.

But this Necessity not extending to all Muscles, and a Ligament being of it self immoveable and insensible, and the *Nerves*

being, in respect of the Softness and Laxity of their Substance, not sufficiently strong to pull great and heavy Bones without some Accession of Strength, it was requisite there should be of both those Parts composed a third, that might be firmer and stronger than a *Nerve*, but softer and weaker than a *Ligament*; such is a *Tendon*, which in Sense and Aptitude to Motion much exceeds a *Ligament*, and in Strength a *Nerve*, and is therefore made a Part of many *Muscles*; I say, of many *Muscles*, not of all, because some have no Need of *Tendons*; as the *Muscles* of the *Tongue*, of the *Testicles*, *Penis*, *Lips*, *Forehead*, and the *Sphincters*; but those only that are framed for Motions either strong or continual. Those that were destined to the Motion of Bones, do all end in *Tendons* greater or less, and are inserted not into the *Syntax* or Conjunction of two Bones, nor into the End of the same Bone from which they arise, but near to the Head of another which they are to move. Those which are to be kept long in Motion, have likewise Need of *Tendons* both to corroborate and facilitate their Motions; as is most evident in the Muscles of the Eye, all which are furnished with *Tendons*. Hence we come to understand, why *Tendons* are by Nature conferr'd upon all Muscles designed to perform strong Motions in *Flexion*, in *Extension*, and in that which is term'd *Motus Tonicus*; as in the Arms and Legs, and in the Back for the Erection of the *Spine*, &c. and why other Muscles are made up without *Tendons*, being as in their Originals, so likewise in their Ends, only *fibrous*.

That these four Parts of a *Muscle*, namely, *Flesh*, *Nerve*, *Ligament*, and *Tendon*, might not want either Covering or Combination, Nature has providently invested and bound them together with a proper Membrane or Coat, which seems to have these two farther Uses, *viz.* to cause *Muscles* touching or lying upon each other to slip up and down smoothly, easily, and without interfering, and to unite the Force of all the *Fibres* when they act. And finally, because the whole Organ requires to be continually supplied with Life, therefore it is copiously furnish'd with *Arteries* and *Veins*: Those to bring *Blood*, by whose vital Heat all Parts are impregnated with insipient Life: These to re-

turn the same *Blood* to the *Heart* after it hath performed that Office. And this may be sufficient to explain the Constitution of a *Muscle*.

As to the second Thing to be consider'd, namely, the *Differences* observed among many various *Muscles*; these are many, as being taken from their Diversity in *Substance*, *Quantity*, *Figure*, *Position*, *Origination*, *Insertion*, *Actions*, and *Uses*, all which I shall lightly touch upon. And first in respect of *Substance*, some *Muscles* are mostly *Carnous*, as all the *Sphincters*, the *Muscles* of the *Tongue*, &c. Others mostly *Nervous* or *Membranous*, as the *Fasciata* abducting the *Tibia*, the *Quadrata*, called by *Galen Musculosa Expansio*, by others *Distortor Oris*, because it is first involuntarily contracted in that *Convulsion* named *Spasmus Cynicus*, and some others.

In respect of *Quantity*, some are long, as the *Rectus Abdominis*, the *Longissimus Dorsi*, the *Sartorius* in the *Thigh*, &c. others short, as the *Pyramidales* in the Bottom of the *Belly*; others broad, as the *Oblique* and *Transverse* *Muscles* of the *Abdomen*, the *Latissimus Dorsi* depressing the *Arm*, &c. others narrow, as those of the *Fingers* and *Toes*; others thick and bulky, as the two *Vassi* of the *Thigh*, the *Glutaei* of the *Buttocks*, &c. others thin and slender, as the *Gracilis* bending the *Leg*, &c. In respect of *Figure*, some are triangular, some square, some pentagonal, some pyramidal, some round, some of other Shapes; as is exemplified in the *Deltoides*, *Rhomboides*, *Scalenus*, *Trapezius*, &c. In respect of the *Position* or *Course* of their *Fibres*, some are oblique, some transverse, some above, some below, some before, some behind, some on the right, others on the left Side: Where we may observe in the general, that all oblique *Muscles* serve to oblique Motions, all right to direct Flexion or Extension, all internal to Flexion, all external to Extension.

In respect of their *Origination*, some arise from *Bones*, and that either from the Heads of them, as most of the greater *Muscles* do; or a little below, or from some *Sinus* or small Cavity in the *Bone*; some only from one *Bone*, some from two or three; others from *Cartilages* or *Gristles*, as the *Muscles* proper to the *Larynx*; others from the *Membrane* inthrouding the *Tendons*, as the *Musculi Vermiculares* five *Lumbricales* in the

Hands and *Feet*; and others again from other Parts, as the *Sphincters*. In respect of their *Insertion*, some are inserted into *Bones*, some into *Cartilages*, as the *Muscles* of the *Eyelids* and of the *Larynx*; others into a *Membrane*, as the *Muscles* moving the *Eye*; others into the *Skin*, as those of the *Lips*; some arising from divers Parts are inserted into one, and on the contrary, others single in their *Original* are divided into their *Terminations*.

In respect of their Parts, by which we understand the *Head*, *Belly* or *Tail* of a *Muscle*, the *Differences* are various. Most *Muscles* have but one *Head*, yet some have two, some three; whence they are named *Bicipitis* and *Tricipites*. Most have but one *Venter*, yet some are double bellied, as the *Muscle* shutting the lower *Jaw*, that of the *Os Hyoides*; whence they are called *Digastrici* and *Biventre*s. Of some the *Tails* are broad and membranous, of others round and slender; of some short, of others long; of some perforate, of others entire; of some single, of others double, triple, &c. In respect of the Diversity of their *Actions*, in short, the *Muscles* admit of a triple Difference: The first is, that some are *Confederates*, both concurring to one and the same Motion either of *Flexion* or *Extension*, one being placed on the right, the other on the left of the Member; others *Antagonists*, which perform Motions contrary to each other. And indeed there are but few *Muscles* that have not their *Opponents*: To every *Flexor* is opposed an *Extensor*, to every *Adductor* an *Abductor*, to every *Elevator* a *Depressor*, excepting only the *Sphincters*, the *Cremasters*, and the *Oesophagus*. The *Confederates* generally are equal in *Size*, *Number* and *Strength*; the *Antagonists* not, but different according to the *Weight* of the Part to be moved, and to the *Force* of the Motion. The second Difference consists in this, that some of the *Muscles* move only themselves, as the *Sphincters*; others move other Parts besides themselves. The third and last Difference arises from their proper Motions; whence some are named *Flexores*, others *Extensores*; some *Elevatores*, others *Depressores*; some *Adductores*; others *Abductores*; some *Rotatores*, some *Maseteres*, some *Cremasters* or *Suspensores*, some *Constrictores*, &c.

As for the last general Theorem, namely, the Reason and Manner of the Muscles moving the Parts to which they are affix'd when themselves are invigorated by the Will or Appetite; forasmuch as the Locomotion of the whole Body, or any Part thereof, if consider'd *per se*, that is, merely as Motion, must be consider'd either as it is a certain Commensuration of the Length of Space betwixt the *Terminus a quo* and the *Terminus ad quem*, or as it is a Countervailing of Gravity. In both these Respects it requires to be explained by the Help of Mathematical Principles.

In the first Place then I observe, that every Muscle hath a double Motion; the one Natural, in which the Fibres spontaneously retracting themselves, return to their native Position after the Cessation of that Force that extended them, as all other *tensil* Bodies do by the Motion of Restitution; the other Animal, in which the same Fibres are farther contracted or abbreviated by a Force communicated to them from the Brain, in order to the Performance of some Action intended by the Will or Appetite.

Now that the natural Contraction of a Muscle is not sufficient for Voluntary Motion, though we should suppose it to have been at first made upon the Stretch, is evident from hence, that betwixt every Muscle and its Antagonist the natural Power of retracting or relaxing themselves is equal; so that betwixt two contrary Powers drawing equally, the Member must remain *tanquam in Equilibrio* unmoved; the Reason of which Equilibration may be illustrated by that Proposition of *Vitruvius*: *Qua Corpora aequalia aequaliter & sub uno Diametro a Centro distant, illa secant perpendiculararem Lineam ad Angulos rectos*. As for Example: Let two Bodies of equal Weight be placed, the one at one End, and the other at the other End, of or upon the Diameter of a Circle, and neither of them shall move, because their Gravity is equal at that Distance from the Center; but supposing both to move, they shall hasten to the Center of Gravity with equal Velocity, because they make equal Angles with the perpendicular.

It is necessary then, that, in Voluntary Motion of a Member equilibrated by two Antagonist Muscles of equal Force, one of the op-

posite Muscles overpower the other, not by its natural or spontaneous Contraction, which is equal on both Parts; but by the Animal Force derived from the Brain, which makes the Natural Contraction greater, and the invigorated Muscle prevail: Whence it comes to pass, that the Member, which before the Accession of the Animal Force was held unmoved, and as it were suspended betwixt two contrary equal Powers, is determined to Motion according to the Command of the Will or Appetite. In the next Place I observe, that in all Voluntary Motion, of whatsoever Member, there are two Terms to be acknowledg'd; one is the *Part quiescent*, or *Fulciment* to which the Head of the acting Muscle is fasten'd, because all Motion is made upon something that is at Rest; the other is in the *Part moved*, at the Insertion of the Muscle moving, and from whence the same Muscle doth by contracting it self draw the Member toward it self: And this is sometimes less, sometimes more elonged or remote from the *Fulciment*, according to the less or greater Resistance of Gravity in the Member to be moved, and according to the less or greater Vehemence required to the Motion it self; which Nature (whose Art is not more admirable in any Thing, than in proportioning the Length of the Insertion of every Muscle, from the *Hypomochlion* or Point of Rest to the Weight of the Part thereby to be moved) respecting, hath with great Sagacity supplied the little Strength of many slender Muscles, by inserting them at great Distance from the Center of their Motion, or that Point about which the Member whereto they belong is to be moved. The Reason of which Mechanical Contrivance seems to be this; that all such remote Insertions, by subtracting Part of the Length of the Bone to be moved, subtract also Part of the Weight of it, and so render the Muscle able to countervail the remaining Weight with less Force.

For since there is no Motion in the Center, according to that Proposition in Mechanicks, *In Centro omnis Gravititas cessat, adeo ut neque gravis, neque leve ad Centrum deprehendatur*; we may easily understand, why in many Muscles designed for strong Motions, the *Terminus Stabilis* is farther elonged from the *Terminus Mobilis*, than in others destined

to Motions less strong; viz. that by even a small Force the Muscle, which consider'd in its proper Bulk, or inserted at less Distance, would be insufficient to the Effect intended, might countervail and elevate a great Weight, as is exemplified in the Muscles of the Hand, Arm, Thigh, and some other Parts.

Now this Reason may be both confirmed and illustrated by Three Mechanick Propositions; of which the First is this: *Omnis Potentia Motus variatur ratione Centri ad Peripheriam*. The Second is this: *Quo quid remotius a Centro, eo velocius movetur*. The Third is: *Quo Circuli Peripheria est major, eo major est Diameter, & Motus velocior*. And for the same Reason, viz. to augment the Force of some Muscles consider'd simply without the Advantage of Position, it was also, that Nature has in many Bones superadded to their Ends certain *Knobs* or *Buttings* out, called *Epiphyses* and *Apophyses*, to which the Muscles are fasten'd: Nor doth it seem to be of simple Conveniency alone, that she has thus contrived the Originals of all great and most other Muscles higher or more elevated, more or less, than their Insertions, but of absolute Necessity; for First, Were the Head of any Muscle incumbent upon another, or upon any other sensible Part placed lower than its Tail or *Tendon*, the Muscle could not be contracted without manifest Pressure and Pain of the subjacent Part.

Secondly, Had the Head of any Muscle designed for the Elevation of a Bone been placed upon the same Level, or in a straight Line with the Tail of it, then could not the Muscle have been contracted at all, nor consequently could the Bone into which it is inserted have been rais'd upward; because the *Fulciment* or Bone from which the Head of the Muscle arises, being in a direct Line to the other Bone that is to be raised, and into which the Tail of the same Muscle is inserted, the Ends of the two Bones must necessarily press one on the other in a direct Line, and by their mutual Resistance hinder the Contraction of the Muscle.

But Nature perhaps had yet another Reason of this Mechanick Artifice, which I conjecture to be this: Forasmuch as the Use of all Muscles is to move the Parts into which they are inserted, and that they can-

not move those Parts that stand in a direct Line with their Insertions, but by bringing them to make obtuse Angles with the Bone upon which they rest, and that obtuse Angles cannot be made by Contraction of the Muscles, unless their Originals be higher than their Insertions; therefore it was necessary they should be so frained; for where the Bone to be moved is articulated in a direct Line with the Bone that remains quiet, as the Bones of the Limbs generally are, the moveable Bone cannot possibly be moved, but it must make an Angle first more obtuse, and then less and less obtuse, until it come to a right Angle with the other Bone, that is the *Hypomocion* or Rest. For the Motion of a Bone made by Contraction of a Muscle, is but an Elevation or Translation of it from its former Position in a right Line, with the superior Bone to which it is articulate, toward a perpendicular or right Angle with the same; and that Transition, from a Posture direct to a Position *rectangular*, is made by *Angles* less and less obtuse successively betwixt the two Bones. And as for the Elevation of a heavy Bone by a Muscle in this Manner, that cannot be effected, where the Force moving is either in a Line parallel to or lower than the Bone to be moved; but where the *movent* is superior or higher, and by how much higher the *movent* Power is placed above the Bone to be moved, by so much more easily is the Motion performed, as may be evinced by the Mechanick Demonstration of a *Leaver*, with a Weight hung at one End, and a perpendicular Cord in the Middle, with two other oblique Cords; I say then, that the Weight at the End of the *Vellis* or *Leaver* is much more easily or with less Force lifted up by the perpendicular Cord, than by either of the oblique Cords; for when the perpendicular Cord is pull'd, the whole Force is employed only in raising of the Weight; and therefore by how much nearer the Line is to the *Leaver*, by so much the more easily is the *Vellis* moved, and the Weight elevated: And on the contrary, by how much the further the oblique Lines recede from the perpendicular toward a Parallel with the *Vellis*, by so much the greater Force is required to raise the Weight; because in a Position parallel, the Traction or Force is either direct-

ly from, or directly toward, the *Fulcrum*, and consequently can never raise the *Vestis*.

Whence we may easily collect the *Reason* why the *Muscles* generally have their *Origins* somewhat higher than their *Insertions*, and why their *Motions* are so much the stronger, by how much the higher their *Heads* are raised; which is what was to be inquired. There is yet another *Mechanick Artifice* of Nature both to facilitate and

corroborate the Force of *Muscles* designed to effect strong *Motions* or elevate weighty *Bones*, and that is, as hath been before hinted, by prolonging their *Tendons* to greater Length than those of other *Muscles*; for, to the sustaining of a Weight upon a *Vestis* or *Leaver*, it is all one whether the sustaining Cord be shorter or longer, provided its same Degree of Advance toward a perpendicular be observ'd.

Of Nutrition, and what else relates to it, agreeable to the Opinions of Harvey, Glisson, Malpighius, Willis; and particularly from that incomparable Tract of the Learned Sir George Ent, called his Antidiatriba.

THAT I may both illustrate and confirm this Doctrine of *Nutrition*, give me Leave to represent the Method and Process of Nature in the Formation of a Chick out of an Egg, according to the most accurate Observations of *Malpighius*, the Sum of which is this: *First*, That the *Spirit*, *Plastick* Virtue, or *Archeus*, call it by what Name you please, of the Egg, lies dormant as it were and unactive for some Time after the Egg hath been laid, as if it expected the Incubation of the Hen, or some other Warmth equivalent thereto, to help it to exert its Power, and begin the great Work, and build for it self a House, according to the *Idea* or Model prescribed by the Divine Architect, whose Instrument it is. *Secondly*, That this *Spirit* having drawn the first Lines or Threads of the solid Parts of the *Embryo*, and disposed them into their proper Seats, doth immediately after design certain Ways or Passages by which those slender and delicate *Stamina* may be commodiously supplied with vital and nutritive Liquors for their Enlivening and *Nutrition*, and to that End mark out or appoint three Fountains; one out of the first Rudiments of each *Ventricle* of the *Heart*; and a third, consisting of many

Rills, flowing from the like Rudiments of the Brain. *Thirdly*, Lest these so necessary Fountains should by Exhaustion fail, the same Architect provides also for their perpetual Supply. To irrigate the Brain, Rivulets are brought thither from the Trunk of the grand Canal of the *Heart*; and to feed the Current of the *Heart*, three new Streams are derived to it; one from the interior Lake or *Colliquamentum*, a second from the exterior by the *Navel*, and a third from the Yolk of the Egg by Veins: By all these importing Conduit-pipes, fresh Liquors may continually be deduced from the Parts nourished into the *Heart*.

Fourthly, 'Tis evident, that the same invisible Agent advances in the next Place to distribute the Vessels derived from the Rudiments of the *Heart*, viz. the *Arteria Pulmonaris* and *Aorta*, first whole, then divided and subdivided into Branches still smaller and smaller, till at last they dwindle into *Capillaries*; and on the contrary, to collect and by Degrees unite all the Rivulets that return from the *Stamina* of the solid Parts to the *Heart*, till they all meet and make a *Confluent* in the single Trunk of either the *Vena Porta* or *Vena Cava*. And *Malpighius* hath,

hath, by the Help of *Microscopes*, observed certain varicous *Veins* lying in the *Umbilical Area* or Space not yet extended to either the *Heart* or *Liver*; and therefore also not the *Heart*, but the *Stamina* of the Parts circum-jacent, ought to be reputed the Origine of the *Veins*.

Fifthly, 'Tis no less evident, that from the Beginning the vital *Succus* is clear and transparent, and so remains till somewhat of the *Yolk* hath been mix'd with it. For not only *Malpighius*, but our equally curious Dr. *Glisson*, expressly affirms, that he had seen Blood of a rusty Colour in the Coats involving the *Embryo* of a Chick, before any of the least Signs of Blood could be discern'd in and about the *Heart*. But this so early Beginning of Blood may be ascribed either to the speedy Excitation of the Spirits by Incubation of the Hen, to whose Heat those *Veins* are somewhat nearer than the *Heart* is; or to this, that perhaps somewhat of a yolkly Tincture had preceded and caused that rusty or dark Red.

All the *Canals* of the Body being fix'd and open'd, and the vital Liquor exalted some Degrees nearer to Perfection, the Spirit aforementioned proceeds to finish the whole Body; so regulating its Operations, as to augment those Parts first which ought to be first used; and then to add to the Dimensions of others, whose Use may be longer wanted without Detriment. The same Spirit, as it spins the first *Stamina* of all the solid Parts, so doth it gradually augment and compleat them all out of one and the same homogeneous Liquor, and this by *Transmuting* the same into as many several Forms, as there are different Kinds of similar Parts in the whole Body; namely into Bones, *Cartilages*, *Ligaments*, *Tendons*, *Membranes*, *Fibres*, &c. so that all the Organs are at length compos'd of dissimilar Parts by wonderful Artifice, without the least of Confusion or Incongruity. Now therefore that we may accommodate this to our present Purpose, if this be the Method and Process that Nature uses in the Generation of *Oviparous Animals*; and if she uses the like in the Production of *Viviparous* also, as Dr. *Harvey's* Observations and our own assure us that she doth: We may safely conclude, that Humane *Embryos* are in like Manner form'd,

augmented and finish'd, by one and the same Spirit, out of one and the same Matter.

I shall add, that the same Spirit remaining and working in us through the whole Course of our Life, doth in the same Manner perpetually regenerate us out of a Liquor analogous to the *white* of an Egg, by transmuting the same into the Substance of the solid Parts of our Body: For *Nutrition* is necessary to all Animals, not only in respect of the Augmentation of their Parts, while they are little *Embryos*, but also in respect of their Conservation after during Life; because their Bodies being in a natural Consumption or Exhaustion, wou'd inevitably be soon resolv'd into their first Elements, unless Providence in a natural Course had ordain'd a continual Renovation or Reparation of the Parts by Substitution and Assimilation of fresh Matter, in the Room of those Particles dispers'd and consum'd.

The *Depredator* then, or efficient Cause of the perpetual Consumption of our Bodies, seems to be, what all Philosophers unanimously hold it to be, the *vital Heat* of the *Blood*, therein first kindled, and continually renew'd, and by the Arteries diffus'd to all Parts of the Body, that they may thereby be warm'd, cherish'd and enliven'd. This *vital Heat* continually glowing within us, and principally in the *Ventricles* of the *Heart*, is called the Flame of the Lamp of Life, and is what we generally understand by the *Calidum innatum*. But supposing it to be an *actual Heat*, consisting in a certain Motion of the various Particles of the Blood, and in some Degree analogous to Fire or *Flame*, I cannot conceive how 'tis possible for it to subsist or continue for so much as a Moment of Time, unless it be maintained by convenient Fuel, which is thereby incessantly fed upon, and by Degrees consumed: This *vital Heat* therefore without Intermission agitating, dissolving and consuming the minute and most easily exsoluble Particles of the Body, must be the *Depredator* here sought after.

The Matter consumed we may suppose chiefly to be the fluid Parts of the Body, especially the *Blood* and *Spirits*, which are easily exsoluble, and somewhat, though but little,

little, of the Substance of the solid Parts ; for Experience shews us, that divers Animals, as *Bears, Dormice, Swallows, &c.* sleep the whole Winter without receiving any Supply of Aliment ; and yet have all the solid Parts of the Body as large and firm when they awake again in the Spring, as when they first betook themselves to their *Dens* or *Dormitories* ; and the Reason seems to be this, that their *Vital Heat* being all that Time calm and gentle, consumes their Blood and Spirits but slowly, as a Lamp burns long when the Oil that feeds it is much, and the Flame but little and calm.

As for the Manner how the *Blood, Spirits,* and other Fluids are consum'd by the Vital Heat ; this may sufficiently be explain'd by the familiar Example of Oil consum'd by the Flame of a Lamp. Now continual *Dispersion* being the proper and visible Effect of Fire or Flame, the Matter or Fuel wherein it subsisteth cannot but be in continual Flux or Decay. In like Manner the *Vital Heat* of Animals subsisting by a continual Accension of new Spirits in the Blood, those Vital Spirits no sooner arrive at the *Heart*, but having warm'd and inliven'd the solid Parts, they immediately fly away, and disperse themselves by insensible Transpiration. Moreover, there being in all the solid Parts of the Body certain mild, sweet, and balsamick Spirits, as it were affix'd to and incorporated with them, 'tis very probable that the Vital Spirits acting upon them by little and little, dislodge them, render them volatile, and at length wholly disperse them ; whereupon the minute Particles in which they did reside are excluded together with the Exhalations of the Blood.

Here no Man I hope will exact an accurate Computation of the daily Expences of this Vital Heat ; but we may conjecture from the statick Experiments of *Sanctorius*, that the Expence is great : For Instance, if forty Pounds of Meat and Drink be supposed sufficient to maintain a Man of a middle Stature, and of good Health, for ten Days, and about twenty Pounds be assign'd to the Excrements voided by Stool and Urine in that Time, the other twenty Pounds may be reasonably ascrib'd to insensible Transpiration ; but if this be conjecture, it is sufficient that we know the

Quantity of *Blood* and *Spirits* daily exhausted by the Vital Heat that conserves Life in us is very great ; and that the greatest Part of the Matter of insensible Transpirations is the Vital Spirits, which are continually generated, and continually dispers'd.

How apt and powerful these Vital Spirits are, by reason of their Subtility and brisk Motions, to exagitate and disperse the more exsoluble Particles of even the Nerves, Fibres, Membranes, and other tender and sensible Parts, may be in some Measure collected from various *Diseases* and *Symptoms* that seem to arise from their various Depravations or vicious Qualities. I shall therefore beg Leave to make a short Digression, that I may enumerate a few of those painful and contumacious Maladies which are with good Reason referrible to the Vices of the Spirits, rendring the Tone of the nervous Parts either more strict or more lax than it ought to be, at least according to the Doctrine of *Prosper Alpinus*, illustrated by Doctor *Glisson*.

If it happens that the *Blood* is too vicious, that is, too abundant in Spirits, many Times it induceth Diseases depending upon *Fluxion* ; for being by the Arteries protruded into the tenderer Parts, by greater Force and Impetuosity than is fit, it rather invades than cherishes them, by that Violence putting their unfix'd Particles into a Flux. And this Fluxion usually first invades such Parts as being weaker than the rest, are therefore more dispos'd to receive it. If the prevailing Spirits of the *Blood* be not only vinous but saline also, many Times there ensues the like *Fluxion*, conjoin'd with a *Languor* and Laxity of the Tone of the Parts, such as is always observ'd in *Catarrhs*, in moist Coughs, Drunkenness, Heaviness to Sleep, the running Gout, &c. And 'tis remarkable, that these *Fluxions* are usually so much the more fierce and vexatious, by how much the more infirm and yielding the Nerves and Fibres of the Part invaded are ; because these want Strength to make Resistance by vigorous Contraction of themselves : Whereas Nerves naturally strong and tense, somewhat repress and break the Force of the *Blood* rushing in upon them : But if this resolving *Fluxion* happen to be accompanied with a Fermentation of the

Blood,

Blood, then commonly the evil Consequent is a *Rheumatick, Arthritick, or Pleuretick Fever.*

On the contrary, if the *Spirits* that have obtain'd Dominion in the *Blood* be *sulphureous* or *oily*, there follows a *Fluxion*, causing a Constriction and shutting up of the invaded Part. For tho' the Arteries pour out *Blood* abounding in impetuous *Spirits*, and so cause a *Fluxion*; yet notwithstanding those *Spirits*, by reason of their *Oiliness*, neither easily pass through the Habit of the Parts, as the *saline* do, nor are dispers'd by insensible Transpiration, but remain shut up as in a close Prison, and striving for Liberty, raise great Tumults and Pains. Hence are excited various *Symptoms*, according to the various Parts into which the *Fluxion* rusheth. In particular, if the *Fluxion* be determin'd upon the Guts, there follow grievous *Cholick Pains*; if in the *Stomach*, a dire Inflation of it; if upon the Limbs, that sore Affliction called the *Rheumatism*. Hence also come wandering *scorblick Pains*, *hypochondriack Winds*, *Rumbles* in the *Stomach* and *Guts*, *Head-ach*, *Tooth-ach*, &c. And all these Evils are the more aggravated, by how much the more firm and tense the Nerves of the Part affected are; whereas in *saline Fluxions* the contrary happens, tho' they be no less pernicious in the End, by relaxing, fretting, and as it were melting the Tone of the Parts affected.

In short, if the Strength of the Nerves and Fibres be greater than the Force of the Blood flowing in from the Arteries; in that Case, Diseases contrary to *Fluxion* will succeed; *viz. Obstruction* and *Infarction*, and for the most Part *Transpiration* hindered. And this Vice is always the more intended, by how much the more languid and sluggish the Vital *Spirits* are; for when there are copious and vigorous, they easily prevail over the light Renitence or Reluctance of the Nerves, and, inauvre their Opposition, carry on the Blood in its Circuit; but when they flag and act but dully, they yield to the Opposition of the Nerves and Fibres, and leave the grosser and more vitid Parts of the Blood sticking in the Passages. In a *Cachexy*, *Dropsy*, *Asthma*, *Scurvy*, *Obstruction* of the Pipes, of the Lungs, Tumours and Inflammations of the *Viscera*, &c. the Nerves commonly are more

strait or tense then they ought to be. But if a *saline Fluxion* chance to be conjoin'd with, or to supervene upon such an excessive Tension of the Nerves, it either wholly solves the Disease, or very much mitigates it at least: Whereas on the contrary, if while the Nerves and Fibres continue strong, such a Constriction of them be accompanied with a sulphureous *Fluxion*, then it causes dismal Tempests in the Parts affected; *Convulsions*, *Epilepsies*, *Apoplexies*, extream Difficulty of Breathing, Suffocation, *Hysterick*, and other the like Passions.

From the Causes and Manner of the continual Consumption of Substance in Animals, we may opportunely proceed to an Inquiry into the Causes and Manner of the constant Restauration of the same by Way of Nutrition. The material or constituent Principle, I take to be a certain mild, sweet and Balsamick Liquor, analogous to the White of an Egg, or at least the *Colliquamentum* out of which the Chick is form'd: For since all Animals are nourish'd with the same out of which they were at first made, we may well conclude, that the *Succus Nutritivus* is in all Qualities like the *Colliquamentum* of the White of an Egg; and as to the Manner how this homogeneous Matter is accommodated to the Refection of all the various Parts of the Body, it is most probable that this admirable Work is done gradually, by *Distribution*, *Apposition*, *Affixion*, or *Agglutination*, and *Assimilation* or *Transmutation*; all which Acts must be successively perform'd before the Operation can be complete.

Now if we reflect upon what hath been here briefly said concerning the double Necessity of Nutrition, and concerning the different Ways by which Life is maintain'd, and the Substance of the solid Parts recruited, it will plainly appear, that the Expence of Aliment taken in by the Mouth, at least of the *Chyle* extracted from it, is double; *viz.* that one Part of it is converted into the *Succus Nutritivus*, the other changed into *Blood*: That we may therefore trace these Footsteps of Nature, we shall first inquire into the Work of *Chylification*, and then into that of *Sanguification*, in order to comprehend the whole Business of Nutrition.

First then of *Chylification*, or the turning of the convertible Parts of our *Aliment* or *Food* into *Chyle*; to the true Knowledge or Understanding of which, we ought to inquire into the History and Nature of the Parts that conduct thereto, as the *Gullet*, *Stomach*, &c. but these being describ'd already at large, we shall think it sufficient to understand and set forth the Uses of the Parts. And first, the proper Use or Action of the *Gullet* is *Deglutition* or *Swallowing*, which is thereby chiefly performed; I say chiefly, because in Truth the whole Process of Swallowing consisteth in a certain Series of many Actions, by an admirable Providence of Nature combin'd in order to one End; for the Power of transmuting Meat and Drink from the Mouth into the Stomach, is founded not only in the *Oesophagus*, but in many Parts of the Mouth also, as in the Tongue, Palate, *Uvula*, and its little Muscles; in the *Larynx* and its Muscles, as well that draw it up, as those that pull it down; in the *Pharynx* and its three Muscles, and in the *Sphincter* of the *Gullet*.

There is also further requir'd a Concurrence of two Humours, one from the *Glandulae Salivales*, the other from the *Tonsils*, to render the Mouth and *Gullet* conveniently moist and Slippery; for we have it from Experience, that when these Humours fail, as in Fevers they often do, the Swallowing of Solids becomes more difficult than the Swallowing of Liquids: And on the contrary, when they are redundant, as in Catarrhs commonly it happens, Solids are more easily swallow'd than Liquids, because the Muscles subservient to this Motion need not be constring'd so closely to gripe and depre'ss Solids, as to squeeze down Liquids.

Now in this Concourse of various Actions requisite to the whole Work of *Deglutition*, some are *Preparatory*, others *Constituent*: The *Preparatory* are, First, The Direction of the Meat and Drink towards the *Fauces*, by the Tongue and Cheeks; Secondly, The Compression of the Atmosphere, commonly called *Suction*; Thirdly, The Compression of the Thing to be swallow'd betwixt the Tongue and Palate, that it may tend inward; and Fourthly, A double *Closure* in the Throat, to hinder the same from slipping the wrong Way, as it is vulgarly

called: All which are fully explain'd by Doctor *Glisson*, in his Book de *Ventriculo & Intestinis*.

First then, the Elevation or raising up the Roots of the Tongue, together with the Head of the *Larynx*, necessarily compresses the *Bolus* sticking in the Throat, and by that Compression forces it into the Mouth of the *Gullet*; for being so environ'd that it cannot slip away, either by the Palate or Funnels leading up to the Nostrils, it must be cramm'd into the Orifice of the *Gullet*, there being no other Way left open by which it may free it self from Compression: Nor doth this instantly cease, but is continued till the Roots of the Tongue and Head of the *Larynx* filling up the whole Cavity of the Throat, have thence driven all the Matter contained therein, and thrust it down into the *Gullet*.

Whilst this Action is perform'd, the Muscles of the *Pharynx* being also invigorated, that is, set on Work by *Tension*, cause its Membrane closely to embrace the Roots of the Tongue and Head of the *Larynx* in their Ascent; but so as that the Orifice of the *Gullet* is at the same Time carried upwards, and a little forward, to meet the Matter to be swallow'd. No Wonder then if the describ'd Compression easily squeeze into the *Gullet* all the Matter brought into the Throat, when the same is promoted by a *Closure* on each Side, from below by the Ascent of the Tongue and *Larynx*, from above by the *Tension* of the Muscles of the *Pharynx*; and at the same Time the Mouth of the *Gullet* is offer'd as a Door by which it may slip away and evade the Compression. No sooner is the Matter in this Manner thrust down into the Orifice of the *Gullet*, than the *Sphincter* Muscle thereof constringing it self, so girds the Orifice, as that it not only prevents the recoiling or slipping back of the Matter into the Mouth, but squeezes it somewhat farther down. And then the *Peristaltick* Motion of the *spiral Fibres* of the *Gullet* beginning, and by Degrees girding the Sides thereof farther and farther downwards, soon thrusts the Matter into the Cavity of the Stomach: And this seems to be the most reasonable and plain Account that hath been given, how the whole complex Work of *Deglutition* is mechanically perform'd.

Of the Actions and Uses of the Stomach. From the same Authors.

LET us then proceed to inquire into the Method, Causes, and Manner of Digestion; wherein we may more opportunely consider the Actions and Uses of the Ventricle or Stomach, whose admirable Structure and various Parts has been so particularly examin'd. In this Disquisition, Nature herself hath plainly mark'd out the Steps wherein we are to tread; and these are divided into eight distinct Operations, which are Hunger, Thirst, the Peristaltick Motion, Reception, Retention, Digestion, Secretion, and Expulsion.

Among the many Differences betwixt Plants and Animals, this is not the least remarkable, That Plants are fix'd by their Roots, which serve them instead of a Mouth and Stomach: But Animals having their Stomachs within their Bodies, and sucking no Juice immediately from the Earth or the like, are therefore forced to change their Stations, and range from Place to Place to find Food convenient for their Sustenance. And because the Capacity of their Ventricles and Guts, is not so great as at once to contain a Quantity of Food sufficient to maintain Life for many Days together, it is necessary they should be often recruited by eating fresh Aliment. Now the Goad that compels them to feed, is Hunger and Thirst; the one urges them to seek Meat, and the other Drink; which Glisson justly calls Appetite, which signifies a Desire after Meat and Drink, or a Sense of Thirst and Hunger. The Object of Hunger is either Absent or Present. The Absent Object proper to Hunger, Doctor Glisson conceives to be that Nutritive Succulency or Juiciness which all wholesome Meats contain in them more or less, and which being alterable, is apt to be chang'd into Chyle, viz. a certain Substance or Matter that is mild, easily mutable, abounding in sweet and fix'd Spirits, that are not destitute of Fatness, and a due Proportion of Salt; for all Aliments contain in them copious Spirits, and those for the most Part fix'd, which the Stomach, by inducing

Fermentation upon them, excites, and brings to a certain moderate Fluor, that they may more commodiously be thence transmitt'd in the Lacteals, and so become Nourishment to all the Parts.

The Present Object, is that offensive gnawing Kind of Pain that molestheth the Stomach whensoever it wants and craves Meat: The Reason of this ingrateful Sensation seems not, as the Ancients taught, to consist in a certain Suction; but to arise meerly from some acid or acrid Humours contain'd in the Cavity of the Stomach, which by Astriction, Asperity, Erosion and Fretting of the inmost Membrane or Tunicle of the Stomach, cause it to feel a Kind of Vellication or Twitching of the Fibres, and to complain of the Want of that mild, soft and nutritive Juice that is requisite to mitigate and extinguish that offensive Vellication. Having thus concisely propos'd what seems most probable concerning the double Object of Hunger, we shall halt to the Constitutions of the Stomach.

These Constitutions are either Common or Proper: The Common are, 1st, The Temperament; 2^{ly}, The Tone; 3^{ly}, The Cavity; 4^{ly}, The Asperity of the inner Coat; 5^{ly}, The Acute Sensation; and 6^{ly}, The porous Substance of the inmost Coat of the Ventricle.

Among these, the first Place is due to the Temper of the Stomach, upon the Justice of which the natural Vigour of craving Meat so necessarily depends; so that if the Temper be depraved or vitiated, the Appetite soon becomes languid and impaired. Of this we have an Instance in a Fever, which no sooner invades the Body, but it dejects the Appetite, inducing great Thirst in the Room of it; and the Reason seems to be this, that as soon as the Febrile or preternatural Heat of the Blood is brought by the Arteries into the inner Tunicles of the Stomach, the Acid Ferment therein lodged is either destroy'd, or at least for that Time over-power'd.

The Second *Constitution* is due to the firm Tone of the Membranes and Fibres of the Ventricle; for if this *Eutonia* of the Organ be any Way vitiated, the Appetite of Course more or less languisheth and decays; because the *Stomach* having its Fibres relaxed, can neither contract it self sufficiently to embrace the Food it receives, nor be duly sensible of the Complacency thence resulting. For both the Relaxation and the infirm Coherent of the Tone of any Part very much diminish the Vigour of it, and induce Sluggishness and Stupidity instead thereof. How requisite to the Excitation of a good Appetite the Firmness of the Tone of the Stomach is, may be collected from the Experience of great Drinkers, who by excessive Distention of the Coats, the continual Soaking of the Fibres, and by diluting and rinsing or washing away the *Acidum Esarium*, as *Helmont* calls it, have little or no Appetite to any Kind of Food; but at length so ruin the Tone of the Stomach, that they become insensible of Hunger, and at last die languishing for Want of due Nourishment, or at least of so much as is necessary to support Nature.

The Third *Constitution* requisite to Hunger, is a just or fitting Capacity or Largeness of the Stomach; for if it were not hollow within, it could neither be sensible of Emptiness, or capable of Repletion. If its Cavity be not of a just Size, it can never receive a Proportion of Aliment necessary to supply the Indigence of the Body. Hence it is, that such who have the Stomach less than is fit, are commonly subject to continual Pains, and frequent Vomitings, after full Meals; and that they on the contrary, who have wide and deep Paunches, often eat more than they can digest, and so render themselves liable to many Disorders.

The Fourth, is a moderate *Asperity* or Roughness of the inner Coats of the *Stomach*; for where this is wanting, as in the *Lientery* it always is, there the Appetite continually languishes till it be wholly lost: And all lubricating Things, or such as induce Slipperiness upon the Inside of the Stomach, whether they be Food or Medicines, sensibly blunt the Edge of Hunger; as *Manna*, *Cassia*, *Eiect. Lenitive*, &c. As on the contrary, all Things that preserve or

increase the *Asperity* of the Lining of the Stomach, as *Verjuice*, unripe Fruits, Pomegranate Flowers and Rinds, whet the Appetite. The Fifth, is an acute Sensation of the Stomach; for was the Stomach a Part endow'd with a dull Sense, How could it be sensible of the Vellication of Hunger? It was not therefore without singular Providence, that Nature made the inner Superficies of the Ventricle extremely tender and delicate, and dispers'd so many Nerves more than can be found in any other Part upon the Membranes composing it: So also in the last Place, the Appetite is inspir'd and dull'd by the Porosity or Spunginess of the inmost Membrane of the Stomach; for if the Pores happen at any Time to be fill'd up with the mucuous or dead Flegm separated from the Blood in that Membrane, as usually they are in Leucophlegmatick Virgins, and such as are troubled with the Greensickness, or daub'd over with any viscous Humour and closed up, as in all scirrhus Tumours of the *Ventricle* they always are, in either of these Cases the Appetite fails, the Membrane ceasing to imbibe the *Chyle*: Hence most probable it is, that Mints, Red Roses, Marmalade of Quinces, and other the like grateful Astringents, which are otherwise beneficial to the Stomach, prove highly noxious if used by those who have Obstructions in it: When Wormwood, Steel, Wine, and almost all aperient Remedies, in that Case excite and revive the languishing Appetite. It is evident therefore, that to compleat the Reason of Hunger, it is required that the inmost Coat of the Stomach should be free from Obstruction.

Having run through the common Constitutions of the *Ventricle* in which Hunger is seated, we come to the Proper, whereof two are *Organick*, and one *Similar*: The First consisteth in the Wrinkles and Folds of the inmost Membrane of the *Ventricle*, which being larger, and capable of greater Distention than the two that invest it, cannot therefore be constring'd by their Contraction without falling into Wrinkles or Folds. Now this Corrugation both augments the *Asperity* of the inner Surface of this Tunick or Coat, and makes it more sensible of Emptiness, which is a Part of Hunger: The other consisteth in the Nakedness of the

the same Superficies of the inmost Membrane, which renders it more apt to perceive, both the ingrateful Gnawing of the acid Humours when it is empty, and the grateful Juice of Meat while it is replenish'd, the very Nerves lying bare to the Touch of both.

The *Similar* and last Constitution of the Stomach, wherein Hunger is founded, is a certain *predatory* or devouring *Quality*, consisting in an acid Impregnation, by which it is adapted to dissolve, melt and ferment solid Meats; so that being mix'd together with Liquids, they are chang'd into a *Milky Chyle*.

Contenting my self therefore with what hath been said concerning the first Action of the Stomach, *Hunger*; I proceed to the Second, *viz. Thirst*. This is also necessary to Nutrition, as respecting the Vehicle of solid Aliment, whereby it is diluted and reduced into a thin and limpid Substance called *Chyle*. A Vehicle is requisite also in respect of the *Blood*, which would be of too thick a Consistence, and unfit to perform its Circuits round the Body, if it were not now and then diluted by fresh Supplies of Drink: Nor could this vital Juice be commodiously purged and cleansed from various Impurities and excrementitious Parts, *viz. the Bile, Salt, Tartar, and Mucus*; unless it were daily diluted with a due Quantity of thinner Liquor; for it is by the Help of our Drink alone that the saline and earthy Excrements of our Blood are driven out by Urine.

That this Appetite of Drink is seated in the *Ventricle*, as in its Subject, cannot be denied; but that it is confin'd to the Ventricle only, cannot be granted: First, Because Drink received into the Stomach, doth not always mitigate Thirst; and therefore that Part of Thirst that remains after a competent Quantity of Drink, must reside in some other neighbouring Parts to the Stomach; for it is unconceivable that the Stomach, when replete with Cold and moist, should still feel and complain of Want of both. Secondly, Because they who in Fevers are tormented with insatiable Thirst, complain not so much of Heat in the Stomach, as Dryness and Parching of their Tongue, Throat and Gullet. Nay, they find

more Alleviation and Relief from frequent Washing of their Mouths and Throats with Fountain Water, Small Beer, and other convenient Liquors, than from all the cold Drink they can pour in. The like Solace they find also from holding in their Mouths such Things as any Way promote the flowing forth of the *Spittle*; such as Prune or Pebble Stone and the like, and *Sal Prunella*, which only held in the Mouth, and there slowly melted, palliates the Thirst; which consists in a Desire after Wine, Water, Beer, Ale, Whey, Cider, and whatever Liquor else is fit to be drank, that is endow'd with the following Properties: First, That it be liquid or fluid, like Water; Secondly, That it be humid or moist; and Thirdly, That it be thin, penetrating, and in some Measure cutting or sharp, to insinuate the deeper into the Membrane which is the Seat of *Thirst*, and moisten further than the superficial Parts thereof.

The present Object that causes the Sensation of this Defect of Moisture in the external Organ, &c. consisteth in the adventitious and offensive Drinels of the Membrane investing the Stomach, Gullet, Throat and Tongue; which being ordained by Nature to be perpetually irrigated with a certain mild Humour, whensoever that Irrigation fails, immediately perceives its natural Constitution to be chang'd, and communicates that ungrateful Perception to the Nerves, and by them to the Brain. But this Driness, which we conceive to be the present Object of Thirst, is not so much a superficial Driness, as a profound and internal one in the Membrane therewith affected; and in that very Respect clearly differs from that outward Driness that falls under the Perception of the Sense of *Touching*.

I come now to speak of the Third Action of the Stomach, to wit, the *Peristaltick* or *Compressive* Motion. The Appetites of Hunger and Thirst being satisfied, the *Ventricle*, sated with that Relief, closely embraces the newly receiv'd Meat and Drink on all Sides, spontaneously contracting it self into a narrower Compass, and thereby lessening its Cavity, so as to compris the Contents.

To found this Peristaltick Power in the Stomach and Guts, for we are not now considering any other of the Cavities of the Body, Five Things are necessary to be consider'd; First, A Cavity or Receptacle; Secondly, Matter therein contain'd; Thirdly, Tunicks or Coats environing the same; Fourthly, *Fibres* to gird or constringe those Coats; Fifthly, Distinct Orders, and different Texture of those *Fibres*: For in what Part soever these Five Things are concurrent, as they are certainly found in the Stomach and Intestines, that Part hath a just Title to a peristaltick Power, and may exercise it whenever Occasion requires. But the two last Things are those in which the Power is principally founded, the *Fibres* alone being the active Cause of the compressive Motion, and the different Orders and Textures of them, the Causes of the Differences of the same Motion. Our Business must therefore be to enquire chiefly into the Actions of the several Orders of *Fibres* formerly describ'd by us in the *Tunicks* of the *Ventricle*, from the Variation of which the various Kinds of this compressive Motion receive their Distinction.

This Motion then is observed to be threefold, *Downward*, *Upward*, and partly *Downward* and *Upward*; the last Sort of Motion being subdivided into, First, that which is performed with a certain *Lustation* or Strife; and Secondly, that which is performed not only without Strife, but with a Kind of *Sport*. Besides these Differences, there are yet others subordinate to them: The *Peristaltick* Motion with Strife, is either *Equal*, and then it may be called *Tonick* or *Æquilibrium*, or *Unequal*, and then it is in the yielding *Fibres* repressing and inverting, in the prevailing the *Peristaltick* Motion inverted. The *Sportive* Motion is from its Use called the *Distributive* Motion of the *Chyle*. Besides, all those different Sorts of the *Peristaltick* Motion have their various *Degrees*, by which also they remarkably discriminate among themselves; as being strong, sometimes languid, one while torpid and sluggish, another while vigorous and quick, sometimes plain and sedate, and sometimes again turbulent and tumultuous.

This Peristaltick Motion downwards being sensibly perform'd in the Swallowing down of Meat and Drink, in the Descent of the *Chyle*, and Exclusion of the Excrements, is sufficiently demonstrated from those Actions, and perform'd by Vertue of all Sorts of *Fibres*. First, by Contraction of the *transverse Fibres*, which like *Zones* making entire Circles, must by shortning themselves make less Circles, and consequently by drawing the Cavity they gird into a narrower Compass, compress and squeeze out the Matter therein contained upward or downward. Supposing then that they begin their Contraction from above, as about the upper Orifice of the Stomach, 'tis necessary they should depress or squeeze down the Matter contained in the Cavity of it; for the inferior *Fibres* are supposed not to be yet invigorated or put into Action, to give Way, and to suffer Distention from the Matter contained: And this very Distention it is that causes them to act, by restoring them to their natural State of moderate Laxity; so that by this Means the inferior *Fibres* being successively excited to pursue this Motion from above downwards, contract themselves successively, till they thrust the Matter contain'd quite out of the Cavity containing it.

Secondly, Of the Right *Fibres*, which also conspire to this Peristaltick Motion downward; for as soon as the *Transverse* contract themselves from above, they compress the Right contiguous to them, and thereby incite them to contract themselves upward by the spontaneous Endeavour of Restitution: So that they pulling the Sides of the Cavity upward, cause it to forsake the Matter contain'd, and by that Means promote the Descent of it: For in this Case it is all one whether the Matter contain'd be depress'd, or the Cavity containing be drawn upward from it. And this Subduction of the Cavity or *Ductus* from the Matter contain'd, answers successively to every descendant Contraction of the Right *Fibres*, till the Matter be brought to the Place where Nature ordain'd it should be detrued. Wherefore this complex Motion of *Transverse* and Right *Fibres*, may not be unfitly or improperly compar'd to the Motion

tion of Earthworms crawling upon the Ground.

Thirdly, By the Contraction of the *Oblique Fibres* which contribute their Help to this *Peristaltick Motion* downward; for as they obtain a middle Situation betwixt the Transverse and Right, so they perform a middle Action; partly depressing the contained Matter, partly drawing the Sides of the Cavity upwards; so co-operating with the Transverse Fibres in the Depression of the Matter, with the Right in the Retraction of the Cavity: And in this Manner all the three Orders of Fibres seem to concur to the Performance of the *Peristaltick Motion* downward. To which the Motion upwards being contrary, and effected by the concurrent Constriction of the very same Fibres, the Manner of it must be contrary, *viz.* by *Inversion* of Order. For if the Contraction of the *Transverse Fibres* begin from below, and proceed upward, they must press the Matter that they gird upward: And the *Right* at the same Time put into Action first from below, must draw down the Sides of the Cavity from the Matter therein contain'd, and consequently help to impel it upward. And as for the *Oblique*, they, as in the former Motion, partly assist the Action of the *Transverse*, and partly promote that of the *Right*; so that this *Peristaltick Motion* from below upwards, is co-incident, as was said, in all Things with the Motion from above downward, unless it be that the Order of Moving is inverted, and the Terms of the Motion contrary.

The two contrary *Peristaltick Motions* being thus explain'd, 'tis easy to comprehend the Reason and Manner of the *Mix'd Motion*, which is partly downward, partly upward, and belongs to the Stomach and Guts. Of this the most accurate *Glisson* hath observed three different *Species*, two with *Luëlation*, and a third *Delightful*; all to be ascrib'd to the same three Orders of *Fibres*, but mov'd in different Manners, and more complexly. First, If it happen that *Fibres* near in Situation to, but sufficiently distinct from each other, Superiors and Inferiors, set upon the Work of *Peristaltick Motion* together, and that some by Compression squeeze the contain'd Matter downward, others urge it upward; in this Case there

must arise, instead of a Concurrence, a Luëlation or Contention of the two mutually repugnant Forces, and the *Peristaltick Motion* must be laborious.

Secondly, That this *Luëlation* may be determined to Equality or Inequality, 'tis requisite that the Forces of the *Fibres* contending be equal or unequal accordingly. To Equality of the Forces is required on both Sides *circular Fibres*, shutting the *Ductus* or Cavity: For if the Matter contain'd should freely slip away, the Scope at which Nature aimed when she instituted this Motion would certainly be frustrated, *viz.* the Retention of Aliment; which great Inconvenience she foreseeing, wisely provided against, by placing strong *circular Fibres* about each of the two Orifices of the Stomach; which seems to be the Reason why in the Stomach, and only in the Stomach, this *Luëlation* is naturally found equal.

But many Times there happens as well in the Stomach as the Guts an unequal and fluctuating *Peristaltick Luëlation*; as may be infer'd from slow and difficult Concoction, from Wind pent in, from a laborious Distribution of the *Chyle*, and many other *hypochondriack Affections*: And in this Motion also, as in the former, the contending *Fibres* are Antagonists, the superior striving on one Part, the inferior on the other: Those endeavouring to thrust down the Matter contain'd, these to impel it upward; but with unequal Forces: Whence it comes, that the Matter is agitated up and down by a Kind of fluctuating Motion, and therefore this unequal Contention is rightly enough call'd a *Peristaltick Motion-Fluctuating*. The *Fibres* concerned in this turbulent Motion, may be divided into two Kinds, the *Prevailing* and the *Yielding*.

The Third and last Kind of the mix'd *Peristaltick Motion*, is that which distributes the *Chyle*; and which is rather placed and painful to both Stomach and Guts than tumultuous or offensive. The Manner of this subtle and complex Motion may be conceiv'd from an Inspection of the Guts of an Animal newly kill'd and open'd, while some-Reliques of the Vital Heat are yet remaining in them; for one shall see the Guts variously shortening, wrigling and wrestling themselves like an Heap of Earthworms crawling

crawling some over others, and striving as it were to creep upward and downward by Turns. Now the Use of this admirable Motion is double; viz. 1. An equal Distribution of the *Chyle*, and other Matters contain'd in the Stomach and Guts: 2. The Agitation of the *Chyle* it self; for all Things admitted into the Stomach and Guts require an equal Distribution in them; but the *Chyle* requires also a peculiar Agitation, that it may be in all Parts of the Guts brought Home to the very Mouths of the *Lacteal Veins*.

Let this therefore suffice concerning the *peristaltick* Motion of the Stomach and Intestines, and let us proceed to the Fourth Action, called the *Reception* of the Stomach, which the Incomparable *Glisson* substituted instead of the Imaginary Faculty of *Attraction* of the Ancients, defining this to be a certain Aptitude of the Stomach, by which it relaxes its Fibres, and enlarges its Cavity, to receive Meat and Drink brought into it without Reluctation: And the Reason that induced him so to do is this, That whenever the Stomach dislikes the Thing to be swallowed, the Act of Deglutition is performed with Difficulty, and accompanied with Nauseousness and great Aversion; but on the contrary, Things grateful to the Stomach, though bitter perhaps and unpleasant to the Taste, are yet swallowed and received by the Stomach with Satisfaction and Delight.

The Fifth Action of the Stomach is *Retention*, which is highly necessary to *Nutrition*; for the Transmutation of newly received Meat and Drink into *Chyle* being not performed in a Moment, but a Work of some Hours, unless they be retained in the Stomach a competent or due Time, both the *Concoction* and *Distribution* of the *Chyle*, without which there can be no *Nutrition*, must be imperfect. This *Retention* seems to be wholly *Organick*, and to consist partly in a moderate and gentle Contraction of all the Fibres of the Stomach, but chiefly of those that close the two Orifices of it, partly in a due Asperity of the inmost Tunicle of the same.

First, In a moderate *Contraction* of all the *Fibres*; because otherwise the Stomach could not closely embrace the Food while it is concocted, which requires a *Tonick Motion* of

all the *Fibres*, and such a one too as renders their Forces in a Manner equal in all Parts of the Stomach, except the two Orifices, where the Constriction is stronger and closer, and chiefly in the superior, which during the whole Action remains closed even to a Point: And this Contraction must be moderate and gentle, because all violent and impetuous Contractions either cause Expulsion, or at least make the Retention tumultuous and inordinate, both which equally frustrate the Design of Nature in the Work of *Chylification*; during which, the Ring of the *Pylorus* is not so closely shut, but that it gives Way to *Liquids* to slide down now and then into the Guts, though at the same Time it strictly retains whatsoever is *solid* and not yet converted into *Chyle*, that it may be farther digested.

Secondly, In a due Asperity of the inmost Membrane of the Stomach; for as Lubricity and Smoothness of any Surface favours the slipping away of Bodies touching it, so doth the *Roughness* conduce to their Adhesion; and all astringent Remedies, as they cause a Contraction of the Fibres, so do they corroborate the Stomach; whereas on the contrary, all lubricating Things conduce more to *Expulsion* than *Retention*. Again, in the *Lientery* there is always too great a *Slipperiness* of the Stomach and Guts, as there is too great an *Asperity* in *Costiveness*.

The Sixth Action of the Stomach is *Concoction*, which according to the Order of Nature is next to be consider'd; for all Food is swallow'd, receiv'd, and then retain'd by the Stomach in order to its *Concoction* or *Conversion* into *Chyle*. That this Operation is not organick, as the others appear to be, but wholly similar, is sufficiently evident from hence, that the *Chyle* it self when made is similar, and all the Actions by which it is made *Chyle* are so too; nor does the Cavity of the Stomach contribute more to this Work, than a Pot doth to the boiling of the Flesh that is put in it over the Fire.

It is true nevertheless, that the Organ in which the Work of *Chylification* is performed is principally the Stomach, in which *Concoction* is most vigorous, and to which Nature hath committed the most difficult Part of the whole Operation. Then knowing what Kind of Operation the Conversion of Meat

Meat and Drink into Chyle is, and where performed, we are to inquire in the next Place; First, What are the capital Differences of Aliments to be concocted in the Stomach: Secondly, What various Alterations the Food ought to undergo before it can be brought to the requisite Perfection of *Chyle*: And Thirdly, What are the Causes by which these Changes are effected.

As to the First, *viz.* The Differences of Aliments to be digested, 'tis well known, that all our Food is either *Meat* or *Drink*, *solid* or *liquid*, and all our Drink either *spirituous* or *watery*. That all potent Liquors require less *Cottion* in the Stomach than solid Meats, is not to be doubted; because they serve rather to dilute the thicker Aliments, and give them a Consistence requisite to their Conversion into *Chyle*, than to Nourishment; and because daily Experience teaches, that by how much the thinner and more penetrating or diuretick they are, by so much the sooner they pass by Urine without any notable Alteration, as we see in the *Spaw* and *Tunbridge Waters*.

Liquid or Spoon Meats also, as Broths, Milk, and the like, are sooner and more easily digested than *solid*; because their *nutritive* Parts being actually dissolv'd beforehand, they require only a light Elevation of their Spirits by the *Fermentation* of the Stomach to make them perfect *Chyle*, and fit to be admitted into the *Vena Lactea*; provided, that if they be of a thick Consistence, as Pap, Barley Cream, Jellies, Butter'd Eggs, and such like, they be first diluted with Drink, that they may more readily pass into the *Milky Veins*.

Solid Meats, as they are of the greatest Nourishment, so are they most difficult of Digestion; for they must pass thro' all the various Alterations requisite to the Concoction of any Aliment whatsoever, before they can be brought to the State of perfect *Chyle*. While they remain in a solid Form, it is impossible for them to enter into the inconspicuous Mouths of the *Lacteals*; and therefore it is necessary they should be melted, and reduced into the Form of Liquor, at least that the Tincture drawn from them may be such before they be offer'd to them.

Now those various Alterations requisite to the perfect *Concoction* of solid Meats are

but two, *viz.* *Liquation*, and *Extraction* of *Tincture*. By the first they are dissolv'd into a Kind of Jelly or Mucilage; for Bread is by Digestion turn'd into a Pap, and the softer Parts of Flesh into a Jelly. The harder Parts of neither are wholly dissolv'd, but for the most part commix'd with the Excrements of the Belly. By the other the Tincture of solid Meats is extracted; and this Alteration is competent to such tough and stubborn Meats as refuse to be dissolved. Some Things indeed are now and then swallow'd down, that, by reason of their Hardness, are incapable either of Dissolution, or of yielding any Tincture, such as Cherry-stones, the Kernels of Grapes or Raisins, &c. Now these are the two requisite Alterations proper to solid Meats; besides which, there remain yet Three others common to both, *solid* and *liquid*. Of these,

The First is *Dilution* or thorough Mixtion of them with the Drink, without which even Liquids themselves, if of a Consistence tending to Thickness, could never be transmitted into the *Vena Lactea*. To this *Dilution* of *Solids* is required at first a small Quantity of Liquor; because a large Draught in the Beginning of a Meal doth dissolve not the whole Substance of the Meat, but only the more tender and thinner Parts of it, and extract them by Way of Tincture, leaving the rest untouched. But after the Substance of the Meat hath been liquated into a Jelly, a larger Proportion of Drink is requisite to give it a thinner Consistence.

The Second is an Exaltation of the Spirits of the Meat to the Degree not of *Volatility*, but *Fusion*, that they may be more easily admitted into the *Vena Lactea*, and passing thence into the Blood, serve to recruit the vital Spirits; for the proper Office of the Stomach is to make of the Food a permanent Liquor, which ought to be replete with gentle Spirits, that the vital, which are continually wasting, may be from thence supplied: Whence we may collect what the Reason is that Wine and all vinous Drinks do less require this Alteration than other Liquors; *viz.* because their Spirits are in the State of Fusion before they are admitted into the Stomach, and so need but little farther Elevation.

The Third and Last Alteration, common to both *Solids* and *Liquids*, is an *Assimilation* in some Measure of the Nourishment to the Nature of the Body to be thereby nourish'd, at least bringing of it nearer to the Constitution of the Body; for by how much the more of Likeness there is betwixt two Bodies, so much the easier is the one transmutated into the other. Of this Assimilation there are two Parts, of which one takes away the Qualities of the Food that make it unlike to the Constitution of the Body assimilant; the other introduces new Qualities more agreeable and conformable to it. The first is destructive of the old Form, the second *eductive* of a new one.

Having run through the general Differences of Aliments to be concocted, and the various Alterations they undergo in the Stomach before they can be brought to be *Chyle*, we come next to consider the Causes of those Alterations; which, tho' many and of various Kinds, may nevertheless be reduced to Two; the *Foreign* or Remote Cause, and that *Inbred* in the Stomach. To the first belong all Things that conduce to the Promotion of Digestion, either by previous Alteration of the Aliments, or by fortifying the Stomach. Those that remotely conduce to the Work of Concoction only by Preparation of the Food, are such as correct the Crudity by the Help of Fire, *viz.* by Boiling, Roasting, Frying or Baking; or such as render Things more mild and tender by *Maceration* in Brines, Pickles, Vinegar, &c. Some make the Food more familiar by Way of hastening their *Maturation*, and others again dispose them sooner to Dissolution by Mixture of some wholesome and agreeable Ferment. Hence good Wine, strong Beer, new and light Bread, very much assist Digestion. Those that do so by corroborating of the Stomach, are *Peptick* or *Digestive Remedies*, as Mints, Roses, Wormwood, Aromaticks, &c. But all these being only *Accessories* and *Foreign*, require no farther Prosecution in this Place.

The *Inbred* Causes of Concoction are either Instruments generated in the Stomach, or the Constitution of the Stomach, in which Concoction is founded. The Instruments are the *Ferments* first contained in the Stomach,

whereof two are *principal*, and two *adjuvant*. The adjuvant or less powerful are the *Spirit* and the *acid Flegm* of the Stomach, both which help toward the Dissolution of the Meat; but because they help but little in Comparison of the other two, I content myself with the bare Mention of them *en passant*. The more powerful are the *acid Reliques* of the former Meal, which, tho' more efficacious than both the adjuvant Ferments, are yet in Comparison of the *grand one* less considerable; therefore I shall pass them over, and come to the proper *Ferment* of the Stomach.

This *Ferment* then is nothing else but the *spirituous* and *saline Effluvia* stirred up by the *vital Motion* of the *Arterial Blood*, effused out of the *Arteries* into the Cavity of the Stomach and Guts, but chiefly of the Stomach, and therein condens'd again into a sharp penetrating and dissolving Liquor, apt to dissolve the solid Meat, and to cause such a Foreign Fermentation, as tends not to Volatilization, but only to Fusion of the same, and infinite Acting upon it, not by open Force or violent Invasion, but, after the Manner of *contagious Ferments*, rather, by clancular Insinuation, and mixing it self first with saline and spirituous Parts, and then with the grosser and less exsoluble.

However, it seems to me sufficiently probable, that this dissolving *Ferment* is peculiar to and generated in the Stomach, because nothing like it is to be found in any other Part of the whole Body; that to the Constitution of it is required a Concourse of both salt and sulphureous Spirits, but chiefly of salt, than which nothing is more sharp, penetrating and dissolving; and that therefore it may be called, as *Nebius* says, *Sal Spiritibus impregnatum, acre ac pungens*; or, as *Glisson*, *Fermentum Ventrliculi iusurium, seu principale Coctionis Instrumentum*; because it doth not only efficaciously dissolve the solid Parts of the Food, but also give it the first Degree of *Assimilation* to the Nature of the Animal out of whose Blood the *Ferment* it self is derived; which may be one Reason why the same Aliment receives a different Preparation in the Stomachs of Animals of various Kinds, the Ferment being in some Sorts different from that in others respectively

ly to the Difference; which is sufficient to hint concerning the Inbred *Ferment* of the *Stomach*.

The Seventh Action of the *Stomach* is the *Distribution* of the *Chyle*, which is performed by Three distinct Actions of the *Stomach* and *Guts*; viz. 1. The Exclusion of the *Chyle* out of the *Stomach* into the *Guts*: 2. The Agitation of it to and fro by the peristaltick Motion, partly in the *Stomach*, but chiefly in the *Intestines*: 3. The Transmision of it into the *Milky Veins*. The Reason and Manner of all which Actions I shall endeavour to explain.

As to the First, namely, The Transfusion of the *Chyle* out of the *Stomach* into the *Guts*, I conceive it to be effected by a double Motion of the *Chyle*; one impress'd upon the *Chyle*, the other natural to it, or spontaneous: The first upward, the second downward. The impress'd and upward Motion, by which the *Chyle* is elevated to the *Pylorus*, I ascribe to the *Constriction* or *Closing* of the whole *Stomach*; for all the *Fibres* of the *Stomach*, by the Motion of Self-restitution, common to all *Tensils*, after they have been extended in Length, more and more contracting themselves by Degrees, of Necessity lessen the Cavity in which the *Chyle* is contained; and this Straitening of the Cavity of equal Necessity raises it up to the *Pylorus*, and the other Orifice remaining close shut up while the whole Act of Concoction lasteth, forces it out at the same in the like Manner as the *Liquor* of a *Clyster* is squeez'd out at the *Pipe*, only by Compression of all Parts of the *Bladder* including it. The natural and downward Motion, by which the *Chyle* slides down into the *Guts*, is to be attributed to its Gravity, which causes it to descend from the *Pylorus* spontaneously into the *Guts*.

But this latter Motion belongs not to that Part of the *Chyle* which is carried off immediately from the *Stomach* by the *Milky Veins* that are proper to it, which yet cannot be much, perhaps not the Hundredth Part of the whole *Mais* of *Chyle*; because the *Vena Lactea* of the *Stomach* are but few, their Number scarcely holding the Proportion of a Hundred to one, with the great Multitudes of those that take in their *Fraught* from the *Guts*.

Nor are all the other Parts of the *Chyle* devolv'd into the *Guts* together and at once, but by Degrees, as it comes to be concocted; for it is constant from the Dissection of Animals alive, that the *Chyle* when it is concocted is fluid or liquid, and visibly distinct, yea easily separable from the solid Meats not yet dissolv'd, as Broth is in a Pot distinguishable from the *Flesh* boil'd in it: And because the solid Meat is for the most part heavier than the *Liquor*, and therefore sinks to the Bottom of the *Stomach*, it must needs by Pressure cause the *Liquor* to rise to the *Pylorus* to give Way to what presses it, so that the thinner Part of the *Chyle* is always first express'd; for the two Orifices of the *Stomach* are of equal Height, and both a little higher than any other Part of the same. Whence may be collected one good Reason why 'tis more conducive to Health to sit or stand, than to lie down upon a full *Stomach*: For in a Man that keeps the Trunk of his Body in an erect Posture for some Time after Meat, the Load of the *Stomach* creates little or nothing of Trouble to the Orifices of it, but beareth only upon the Bottom and Sides; whereas he that lies down soon after he has fill'd his Belly, inverts the Order of his Meat, and turns the liquid Part out by the *Pylorus* before it hath been sufficiently concocted, and so fills his Body with Crudities, than which I scarce know any Thing more pernicious to Health. And this seems to me sufficient to explain the Reason and Manner of the *Devolution* of the *Chyle* into the *Guts*.

As to the Second, viz. The Agitation of the *Chyle* to and fro, this equally distributes the *Chyle* to all the *Guts*, as is not only convenient, but of absolute Necessity to Nutrition: For since Nature hath dispens'd *Vena Lactea* equal to all the *Guts*, 'tis fit the *Chyle* also should be equally distributed to them all sooner or later, that each one may have its Share of the Dividend. Again, since only the outward Superficies of the Matter contained in the *Stomach* and *Guts* bears against the Orifices of the *Vena Lactea*, and since the *Vena Lactea* do not hang forth, or stand strutting into that Matter, but are terminated in the interior Membrane, 'tis requisite the Matter should be turned and revolved to and again, that the whole may

at length be brought to their Doors, and offer'd to them.

Now this is effected wholly by an Operation organical, and the efficient is the *peristaltick Motion* of the Stomach and Guts, proceeding from the alternate Contraction and Extension of their Fibres; as we have shewn when we described the peristaltick Motion: I shall therefore here only consider the *Congruity* of the Figures of the Stomach and Guts to the Distribution of the *Chyle* by Virtue of this *Agitation*.

As the *Stomach* has the Advantage in the Office of *Concoction*, so is the Power of the Guts paramount in the Business of Distribution: And therefore Nature, which conferr'd these Powers in different Degrees upon them, and always accommodates her Instruments to their proper Uses and Ends, framed them Figures most commodious respectively to their peculiar Functions. In particular, the Stomach is made more ample, but shorter, and therefore fitter for the Fermentation of the Aliment; because by how much deeper any Cavity is, by so much more contracted is the *Superficies* of the Matter therein contained, supposing the Quantity equal, and consequently so much the less of it comes to touch the Sides of the Cavity within, and *e contra*. The Guts she made *slenderer*, but *longer*, and therefore the apter to Distribution; because Gracility conjoin'd to Longitude promote Distribution in Three several Respects: 1. The narrow or slender Cavity of the Guts wanting Depth, affects more Parts of the *Chyle* contained in it at once: 2. By reason of its greater Length, it affords Room sufficient to the greater Number of *Milky Veins* to range themselves in the interior *Superficies* of it: 3. By reason of the Gracility and Length conjoin'd, the *Chyle* is more easily moved from the Center to the Circumference.

The Use of this *Distributive Motion* is Threefold: 1. The Reduction of all Things contain'd either in the Stomach or in the Guts to an equal Diffusion, so that they may not lie congested in one Place, and be deficient in another: 2. The opportune Admotion of the whole Mass of *Chyle* to the Orifices of the *Milky Veins*: 3. The Facilitation of the Descent of the *Chyle*. Of these Uses, the First and Second are more eminent in

the Guts by much than in the Stomach; because scarce an Hundredth Part of the *Chyle* is brought to the Orifices of the *Vena Lactea* in the Stomach, the main Stream of it running down into the Guts: But the Third is more conspicuous in the Stomach; because the *Chyle*, that is by this Motion devolved to the *Pylorus*, rarely slips back again, but falls down by that Aperture into the Guts, to the End that it may be there transmittted into the *Vena Lactea*, which is the third and last Act of the Distribution of the *Chyle*, which is done chiefly by Constriction of the Guts, and partly by their Compression, by the Muscles of the *Abdomen* assistant to Respiration, and not by *Attraction* or *Exsuction* of the *Chyle*, as the Ancients ignorantly imagined.

First, I say, chiefly by *Constriction* or *Contraction* of the Guts; because 'tis evident to Sense, that the *Chyle* coming into the Guts, fills their Cavity, swells them up, and distends their Membranes; and consonant to Reason, and the Law of all nervous and fibrous Bodies, that the Fibres of the Guts, irritated by that Distention, should endeavour to recontract themselves to their natural State and Position. Now this they cannot do, but they must at the same Time gird in the Membranes, and straighten the Cavity of the Guts: Nor can the Cavity containing be lessen'd without pressing the Liquor contained, and forcing it to recede some Way or other. Upwards it cannot retire, because the Mouth of the Stomach is shut against it; downward it cannot escape, that Gate being shut by the *Sphincter* of the Fundament. Other Way there is none, but only that which leads into the *Vena Lactea*: This Way then the *Chyle* must take to deliver it self from Pressure by the spontaneous Constriction of the Guts.

Secondly, An external *Compression* of the Guts by the Muscles of the *Abdomen* co-operating to the Motions of Respiration; because 'tis most certain, that by the Contraction of these Muscles, the Guts are compress'd almost on all Parts; and no less certain, that this Compression helps them to squeeze out whatsoever is contain'd in them; as appears in Exclusion of the Excrements of the Belly, in breaking Wind, in Belching, &c. If the Contraction of these Muscles

cles be thought too weak to compress the Guts to a Degree requisite to express the Chyle, we may justly call in the Depression of them by the *Diaphragm* in Inspiration to the Assistance thereof; and that hath been held of so great Force to the Expression of the Chyle out of the Guts into the *Milky Veins*, even by *Picquet* himself, who was a Man of solid Judgment, and very curious in explaining natural Causes by mechanical Principles.

If it be objected, That the Depression of the Stomach and Guts by the *Diaphragm* cannot concur with the Compression of them by the Muscles of the *Abdomen*, because the Contraction of these is not *synchronick* or co-incident with the Distention of that; we have this to answer: It is true indeed, that these Motions are alternate; that is, when these Muscles are contracted, the *Midriff* is relax'd upward, and by filling the lower Part of the Chest, expells the Breath upward, and so Expiration is performed: And on the contrary, when the *Midriff* is distended; at the same Time these Muscles are relax'd, the Towels depressed, the Cavity of the Chest enlarged, and the Air rushes into it from without; and so Inspiration is made. This I say is true, but this Truth seems not to oppugn the Opinion I now defend. For as often as the Compression of the Stomach and Guts by the Contraction of these Muscles is intermitted, so often is their Depression by the distended *Diaphragm* repeated or renew'd; so that tho' these Motions be alternate, the Pressure of the Guts, and consequently of the Chyle contain'd in them, is continued; and as to the Expression of the Chyle into the *Lacteals*, 'tis all one whether the Pressure be from above or on the Sides.

There remain yet two other Actions of the Stomach to be consider'd, *viz.* *Secretion*, and *Excretion*: 1st, By *Secretion*, it separates from the Blood brought into its Membranes by the Arteries, a certain slimy and *sub-acid Mucus*, call'd *Pituita emortua*, dead Flegm, because the Spirits thereof being exhausted, it is of no further Use to the Blood. And 2dly, *Excretion*, by which it exonerates it self of that dead Flegm, of the four Reliques of the Food, of its own decay'd Ferment, and in fine, of whatsoever else is unprofitable or offensive, and that either up-

ward, by *Ructation* or by *Vomit*, or downward into the *Intestines*.

The Chyle being now, as I have said, squeez'd out of the Stomach and Guts into the slender Pipes of the *Lacteals*; flows gently on in them from the Circumference toward the Centre of the Mesentery; the precedent Parts of it being necessarily push'd forward by the succedent, *ut Unda Undam pellit*, till it enter into certain *Glandules* there plac'd. And this may be call'd the first Stage of the Chyle's Progress through the *Galaxy* extruded from thence, partly by more Chyle crowding in, partly by Compression of the *Glandules*, by the distended *Midriff*, and contracted Muscles of the *Abdomen*, it flows into the common Receptacle or Cistern, first discover'd by the curious and fortunate *Picquet*, and thence call'd by his Name.

From the common Receptacle, the Chyle is transfer'd into the *Ductus Chyliferus*, which running upward near the Spine of the Back, and continued quite Home to the *subclavian* Branches of the *Vena Cava*, exonerate themselves into them, and commix the Chyle with the Blood; and this also appears to be done by *Impulse* or *Protrusion*, because the two Productions of the *Diaphragm* lying immediately under the common Receptacle, cannot be distended, as together with the *Diaphragm* they always are in every *Inspiration*, but they must force the Chyle therein contained to give Way, by ascending into the Pipes that from thence tend upwards; after the same Manner as in artificial Fountains the Water is mounted into Pipes, only by pressing the Surface of that in the Cistern.

Perhaps the so often mentioned Compression of all Parts included within the *Abdomen*, by Constriction of the Muscles thereof, may not a little contribute to this Elevation of the Chyle, which is the third Remove of it. Next the Chyle, by the said *subclavian Veins* brought into the *Ascendent* Trunk of the *Vena Cava*, is immediately imported, together with the Blood therein, descending into the Right Ear and *Ventricle* of the Heart, which by its *Systole* or Contraction squeezes it into the *Lungs*, where by their Reciprocations it is more perfectly mix'd with the Blood, and whence it is devolv'd into the Left *Ventricle* of the Heart, and finally thence squirted into the *Arteries*, as soon as it hath

received the Form and Name of Blood; which is the last Stage of its Journey, at least of so much of it as is ordained to recruit the Mass of Blood, and afford Matter for the Supply of the Vital Spirits or Heat.

No Man need blush to adhere to the Doctrine of Sir George Ent in this Point, viz. That a considerable Portion of the most delicate and spirituous *Chyle* is never brought through the *Galaxy* describ'd into the *Blood*, but detach'd, and by other Ways, by Membranes, and Nerves and Fibres, perhaps by Way of *Filtration*, as the nutritious Juice of Plants seems to ascend from the Roots up to the Top of the highest Sprigs, transfer'd to the Brain, and there refin'd into the last Aliment of the spermatick Parts.

Of all the Objections hitherto put into the opposite End of the Ballance, the most weighty seems to be that which hath been by Way of Induction alledg'd by the Learned *Lover*, from a remarkable Anatomical Experiment made by himself, and recorded in his Book *de Motu Cordis & Sanguinis*; whence he infers, that the whole Revenue of the *Chyle* is certainly expended upon the *Blood*. And yet notwithstanding, I dare affirm, that though the Experiment be true and ingenious, the Inference is more than can according to the Laws of right Reason be deduced from thence. The Experiment in short is this: If in a Dog, or any other Animal, sed about three Hours before, the Pipe leading from the common Receptacle then fill'd with newly imported *Chyle* be broken, as without much Difficulty it may, by making a convenient Incision betwixt the two lowest Ribs of the Right Side, and tearing the Receptacle with the Nail of the fore Finger, so as the Course of the *Chyle* into the Thoracick Vessels be intercepted; the poor Animal, how plentifully soever supply'd with Food, will nevertheless perish by Famine within few Days after, and in his Breast will be found a De-luge of *Chyle*.

The Inference is, That it is therefore certain, that the Animal, tho' abounding with *Chyle* in the Stomach, Guts, and milky Veins, dies nevertheless of Famine, by reason that the *Chyle* cannot ascend by the Thoracick Pipes into the *Subclavian Veins*, but is inter-

cepted by the Way; and by Consequence, that the whole Stock of *Chyle* is imported by the chyliferous Vessels into the *Blood*; which seems to me to be far strained: For granting, that whatever *Chyle* is brought from the common Receptacle into the Mass of *Blood* passes thither by no other Way but through the Thoracick Pipes, it will not therefore necessarily follow, that the whole Provision of *Chyle* made in the Ventricle is convey'd thence into the common Receptacle, and so into the *Blood*: For why may not some Part of it be diverted into other Ways, from the Ventricle, by the Membranes thereof, from the Glands of the *Mesentery*, from the *Lumbares*, and other adjacent Parts? Chiefly when the Ways of that Diversion are sufficiently probable, and when otherwise the spermatick Parts of the Body would all be destitute of requisite Nourishment; the *Blood* being so unfit to repair their Exhaustion, that in all Probability it rather preys upon and consumes them, as hath been with many nervous Reasons asserted by Doctor *Glisson*.

Nor is it necessary, because the Dogs upon which this Experiment hath been tried died within few Days after, that therefore they died of Famine; for why might not so great a Wound, penetrating into the Cavity of the Thorax, be sufficient of it self to destroy them in that Space of Time? Why is it not more consentaneous to imagine, that in those Dogs the Blood it self being depriv'd of the requisite Quantity of new *Chyle* daily, and so alienated from its vital Constitution, as to have been no longer fit to afford a continual Recruit of Spirits, became vappid, and so infer'd Death in a few Day's Time, though the solid Parts were not defrauded the while of their Portion of the *Chyle* brought to them by other Ways? That in long Fasting, when new *Chyle* is wanting, the Blood doth usually estuate, grow acrimonious, and prey upon the Substance of the Body, is a Truth so well known that it needs no Proof: But how long after the Wounds had been given did the Dogs live? That our Author forgot to tell us, leaving the Number of the Days undefined, notwithstanding the Circumstance of Time be of great Moment towards the strengthening his Supposition, that they,

they perish'd meerly by *Famine*. For if they surviv'd but two, three, or four Days, 'tis more improbable they should in so short a Time be starv'd to Death, than that they perish'd only by the Wounds they had received.

Again, 'twas necessary, by so great Quantity of *Chyle* effused into the Cavity of the *Thorax*, the Motions of the *Diaphragm*, *Heart*, and *Lungs*, should be highly impeded, that from the Putrefaction of the same *Chyle* an acute *Fever* should be soon kindled, and that the whole Oeconomy of Nature should be in so great Streights perverted into mortal Confusion in those suffering Animals.

There are then, you see, other Causes besides the Interception of the *Chyle*, to which the Death of the Dogs may be with more Likelihood ascrib'd. Where then is the Necessity of that Conclusion, that *Famine* alone kill'd them? Or how doth this Experiment demonstrate, that the whole Revenue of *Chyle* is as due Tribute paid into the Exchequer of the *Blood*. I am therefore to be excused, if I deny this mighty Objection to be of Force enough to subvert the Doctrine of the *Nutrition* of all the spermatick Parts, by the *Succus Nutritius*, clearly distinct from the *Blood*.

Of the Nature of different Fluids, and particularly of the Spirits called Animal or Nervous, and their Motion. From Doctor Paxton's Specimen Physico-Medicum.

IN order to render what I shall here treat of more intelligible, it may not be improper to indulge the Humours of some, in setting out from some general Principles: But that this may not be nauseous, I shall only briefly premise, That every natural Body, or particular Substance, is but an Heap or Aggregate of small and singular imperceptible Parts or Particles, each of which, when consider'd by it self, will necessarily have some determinate Size, Figure, Motion or Rest, inseparably appertaining to its Nature, as also some Position in relation to others. The first Part of this is proved by Experience, for take any Lump or Parcel of Matter, and it may be by some Means or other so divided and subdivided, that its Parts singly become imperceptible. The Second Part is most evident from the undoubted Nature of Quantity.

Every particular Body must be conceiv'd, and is always found in one or both of these two Catholick States or Conditions, viz. either *fluid*, or *consistent*; by reason the Mind

of Man cannot conceive but the Parts of Matter must either be in Motion or at Rest; and I call that a *Fluid*, whose Parts are continually moving, gliding, and slipping from each other, with Union or Cohesion, so in respect of each other always changing Place; as is manifest in Water, Wine, and such Things, by reason they presently part and divide, if not contained and kept together by some resisting Body; so likewise in that if we put any dissolvable Body, as Salt or Sugar, or such like, into any such Liquor, it will not only be divided into invisible Parts, that is, be dissolv'd by it, but will also be gradually scatter'd and diffus'd through the whole, as may be prov'd by the Taste, and this although the Vessel in which it is contain'd is kept unmoved; by which it is certain the component Parts must be moving. I call that a *consistent Body*, whose Parts do mutually adhere, and are united, not leaving or parting from each other so long as it remains in that State. As for hard, soft, moist, dry, tough, brittle, and such like,

like, although we are often apt to consider them as States of Body, yet they are in Reality only Relations to us. Thus we call a Substance hard, that will not give Place to the Pressure of our Fingers; or any other Part of our Bodies soft, that readily will, &c. But if these are considered as Qualities or Conditions in the Things themselves, they are only as the small constituent Parts of Body are more or less moved or at Rest, or some of them moving, whilst others rest with or without Union or Cohesion, as will readily be perceived by any one, who will but give himself Leisure impartially to consider these Things.

We may likewise observe a constant Vicissitude and Change among natural Things; this or that particular *Substance* or *Qualities* beginning to exist, that is, some Parts of pre-existent Matter become clothed with new Qualities, and so acquire from us a new Denomination, and then we say such a Thing is made, generated, or *de Novo* produced. And again, those Parts or Particles thus constituting such a Body, undergo another Change, and then the Qualities that were observed in that are alter'd, and then that Body is said to be dissolv'd or destroy'd; and another, by a new placing these Particles, is again formed. Thus natural Bodies seem to move in a Circle; for Instance, that which was Earth one Day, is Grass the next, then the Flesh of an Animal, and then perhaps moulders into its primitive Earth. Besides, we observe particular Beings to grow and increase, that is, they receive an Addition of new Parts, by which their Bulks are enlarg'd, without any Alteration perceiv'd by us, in such Qualities or Powers, that to us constitute them what they are; as is evident in the animal and vegetable Kingdom, such being esteemed of the same *Species* when little and young, as they are when full grown. And it is certain, that an Addition of new Parts to such Bodies, by which they grow, does necessarily cause a Motion in the Parts so added, or otherwise they could not now be where before they were not; and that such new Parts must have parted, or been removed from other Parts to which before they were contiguous, and Motion without Union and Cohesion is what constitutes *Fluidity*.

It is most evident then from these Considerations, that every particular natural Body, that receives an Addition to its *Bulk*, *Weight*, or *Magnitude*, must have it by the Means and Help of a *Fluid*. This is most apparent amongst Animals and Vegetables, the last being immediately nourished by its Sap, the first by the *Blood*, or some Juice analogous to it, or separated from it. It is likewise most certain, that if the Nourishment, Growth, and Increase of every particular Substance is by a *Fluid*, then their several Alterations, Diminutions, Decays, and Dissolutions, must proceed from the same Cause, by reason these being Changes, necessarily imply a Motion and Disunion of Parts; and the several Alterations and Dissolutions of most Substances are conspicuously effected by *Fluids*; for such are visibly observed to break Prison, forcing, parting and dividing from the more firm and consistent Parts, as every one may remark in the Corruptions, Putrefactions and Dissolutions of Plants and Animals.

But the main Design herein being to explain the Nature, and shew the Manner how Diseases are formed, it will be necessary to premise somewhat of Humane Body, the Subject in which they reside. But in doing this, it is not my Design to go about anatomically to display the organical Parts, that not being so material to my present Purpose; but I shall only consider it as moulded and made up of *Parts containing*, and *Parts contained*, or rather into *fluid* and *consistent Parts*.

It may be thought superfluous to go about to prove, that there are divers *Fluids* in a *Humane Body*, always existing, and easily to be discovered in it, as well as in most other of the larger Creatures; because this is so bright a Truth, it requires no Proof: For he that will doubt of this, may with equal Reason suspect, whether the *Sun* is in our Hemisphere at Noon Day, or whether there is such a Body or not; for if Men will not acquiesce in the Evidence of their Senses in such Things, there can be no Cure for their *Scepticism*; for it is as obvious there are such Things as we call *Blood* in our *Veins*, *Saliva* in our *Mouths*, *Urine* in our *Bladders*, and *Bile* in our *Galls*, as even of the above-mentioned Body.

Having then an undeniable Assurance of the real Existency of several *Fluids*, in our own as well as in other animal Bodies, our next Enquiry is to examine what we know of their Natures, Effects, or Uses, and under what Names they are comprehended, and how to be distinguished. But that I may perform this without Confusion, it will be proper first to rank them into two Sorts, which for Distinction Sake I shall call *Common* and *Appropriate*. I call that a *Common Fluid*, that is diffus'd and may be discovered in most, if not in every Part or Member of the whole Body. I call that an *Appropriate One*, that is to be found in a particular Part, and so is only proper to that. Of the *Common Fluids*, we most apparently discern two Kinds: The component Parts of the one are gross, and to our Senses immediately perceptible; the Parts of the other so very subtle and minute, as not of themselves to be perceived, yet easily to be known by their stupendious Effects, Uses, and Operations. The first of these is well known by the Name *Blood*: The latter is what passes in the Nerves, which according to the received Phrase of Speaking, I shall call *Spirits*. The first of these may for farther Distinction be term'd the *Primary Common Fluid*, it being the Source from whence the second is separated, and so in Nature first, as likewise the Fountain from whence all the *Appropriate* are deriv'd.

The first of these is in a perpetual circulatory Motion, being incessantly impell'd thro' its proper Conduits, the Arteries, into the farthest and remotest Parts of the Body, and then by its own Vessels, or some invisible Passages, it is received into the Veins, and by them return'd to the Heart, from whence it had its Impulse; so that there is not a Part in the whole Man, where some Foot-steps of this crimson Gore may not be perceived. The second, although not so immediately to be by it self discovered, yet its Uses are so obvious, and its Effects so marvellous, that it leaves no Room for Doubt or its Existence: Because we find no entire Member absolutely devoid of some Sense or Motion; not the remotest Surface of the whole Body, but from which we perceive we feel, we are sensible of Pain, and have a Power some Way of moving; all which

art demonstrative Proofs, that those subtle Messengers of the Mind have a Residence, or some Communication there, by reason all Sensation and Motion are performed by 'em; as is evident, in that by hindering their Motions, or some Ways stopping their Passage in the Nerve, the Mind is immediately deprived of all Communication with that Part, Sensation and Motion being there lost.

There being so great a Number of *Appropriate Fluids*, or, if you please, particular Juices, to be met with in humane Bodies, I shall not be so tedious as singly to enumerate them, but shall only rank them under these following Heads:

First, Such as are merely *Excrementitious*; by which I understand such Juices as being separated, are then useless and unnecessary to our Bodies, and are for that Reason exterminated and discharged; some immediately by their proper *Ductus's* adjoin'd or annex'd to their Secretory Vessels, and others are convey'd from the Part where separated, to be deposited and retained in a particular Receptacle prepared for that End, until such Time they may be conveniently discharged the Body. Of this Sort is the Urine, which being secern'd by the *Kidneys*, is repositied in the *Bladder*. Of the first is the Sweat, or what passes by the Pores of the Skin, which is excreted by the Nose, Eyes, or Ears; what is expectorated by Coughing. Of the last again is what is separated into the lower Guts, to be with what is contained in them expell'd the Body by the common Passage of the *Anus*.

Under the Second Head may be compriz'd all such as are partly exclud'd, the Body as *Excrementitious*, and partly again returned with the alimentary Juice into the *common Fluid* from whence they were separated. Among these Kinds are to be number'd the *Saliva*, or the Juice flowing into the Mouth separated by the *Glands* seated above the Head, Neck and Throat, part of which is swallowed with what we eat and drink, and part often spit out; as likewise what is secern'd by the *Liver Pancreas* and all other Juices, that are secern'd and pour'd into the upper Parts of the Bowels above the *Milky Veins*; for some Part of these being necessarily mingled with our ingested Aliments, must

must in all likelihood pass with the *Chyle* into the *Blood*, whilst other Parts will again descend with the gross Parts of our Food through the loathsome Channels of the Gut to be expell'd from thence, as may be reasonably concluded from the observ'd Difference in humane Excrements, according as their Descents are either open or hindred.

Under a Third Head may be reckon'd such as, so far as they appear to us, are only separated that they may be again return'd into the *Blood* from whence they were separated, some after they have made a long and comparatively slow Passage for Uses without doubt, although unknown to us, are again with fresh Juices brought back into the *Fluid* from whence they were parted; as the *Lympha* by the conglobate Glands, which passing by the *Lymphaducts*, is again mix'd with the *Chyle*: And some again seemingly separated, as far as we learn to be immediately remix'd with the *Blood*, as seems not improbable to be done by the Vessels constituting the *Spleen*.

Under a Fourth Head may be accounted such as are only separated for the Use of the very Part where seern'd. Belonging to this Head, is what is contain'd in the Joints, the Humours of the Eyes, the Liquor in the *Pericardium*, and such like; for as for that goes for the Repair and Nourishment of the consistent organical Parts, I do not call that Secretion. Under a Fifth Head may be comprehended all particular Juices separated by the Organs in either Sex, subservient to Generation.

The *Spirits* likewise that are prepared by the Brain are also separated from the *Blood*; but these being diffus'd through every Region of the Body, are treated as a common *Fluid*. Thus although our Bodies abound in such a Multitude of distinct and appropriate Juices, and all these very different in their Natures and Uses, and besitted for very contrary Ends, yet are they all separated from the same *Blood*, the Organs form'd for such Separations being so divinely contrived, and so curiously fashioned, as out of one common Liquor to filtrate or separate so great a Variety, most of which are very unlike in their sensible Qualities. And as it is from one from whence so many are deriv'd; so it is by one only Passage by which that

Common Fluid is supply'd, which is the Source from whence the rest are strain'd, whereby to repair all the Consumptions it continually sustains.

For the *Blood* is not only wasted by these appropriate Juices that thus incessantly drain from it, but also in the nourishing and continually repairing the organical and consistent Parts; for some of these likewise are so loosely compos'd, as to undergo frequent Alterations, as is manifest in that *Flesh* sometimes consumes and wasts, and at other Times grows and increases. However such Parts being by Nature condemn'd to and settled in certain and fix'd Abodes, from whence they are not to be removed; although they may sometimes undergo Changes, and so become incident to Infirmities and Diseases, yet being incapable of receiving any Advantages from Medicines, but as they are convey'd by the *Blood*, and the *Blood* being equally whirld about in Circulation to every Part of the Body, in Proportion to the Capacity of its Conduit, can naturally no more respect one Part than another; so that if the Diseases or Faults of the organical Parts are to be amended or cured by internal Medicines, that must be effected by the Means of the *Blood*; because there is no other Ways whereby they can arrive at them: And the *Blood* being only passive in Circulation, hath no Power to dispose of Medicines more to one Part than another; so that such must, in Proportion to the *Blood*, be equally distributed to every Part of the Body. And this Consideration shews the Vanity of appropriating particular Drugs to particular Parts, and the Lenity of considering Diseases in the *Solids*; since if such were diseas'd, they could be internally remedied no other Way than by the *Fluids*.

Having already observed what a Variety of *Fluids* are naturally contained in a humane Body, it will be very proper to premise somewhat of their Natures in general: It is certain, the Fluidity of Substances is not founded in any Size or Shape of the constituent Particles, but purely and only in their continued Motion; by reason Bodies are not denominated *Fluids* from any Qualities, Powers or Operations, but from the continued Motion, and Want of Union of their

Parts:

Parts: For whensoever that Motion ceases, and the Particles unite or adhere, they lose that Denomination. This continued Motion of the Particles of a *Fluid*, must naturally produce a Variety of Changes and Alterations in the Qualities of such *Fluids*, that consist of Particles different in Size, unlike in Figure, and unequal in Motion; because Particles that bear no Similitude to each other promiscuously moving and roving, must necessarily, by reason of their Unlikeness, meet, strike, jostle and hinder each other, by which their Motions or Determinations being alter'd, the Positions and Habitues they bear to each other change, and of Consequence the Qualities that are only the Effects of such Habitues and Positions. It is from this Reason that all Juices express'd from Plants or Fruits, all strong Infusions, all new Worts or Beer, all Cyders, Perry and new Wines, which plainly, even to the naked Eye, betray the Diversity of their Parts, manifestly, although gradually, change all their Qualities; for from being turbid and opacous, they become clear and transparent; from being sweet and nauseous, they grow pleasant and delicious; from being flat and heavy, they arise to light and spirituous: However they evidently alter, although not always to the Pleasure and Advantage of our Senses in all their Qualities.

Whereas *Fluids*, consisting of homogeneous and uniform Parts, cannot undergo such Changes; by reason notwithstanding such Particles continually move and change Places, yet being equal and uniform, that Motion produces no sensible Variation in the Texture of the Liquor; and from hence it is that the more uniform and homogeneous the Parts of a *Fluid* are, the longer it continues without a sensible Alteration in its Qualities; as may be observed in Quick-silver, in divers distill'd Oils, Waters, Spirits, &c. in Wines, Beers, and all strong Liquors, after they are perfectly fined.

This Consideration of the Intestine Motion of the Particles of all *Fluids*, will easily let us into the Mystery of that Action or Operation of Liquors that is term'd their *Fermentation*, which, in plain *English*, is no more than what we call, *The Working of the*

Liquor. And all such Liquors that are experienc'd to have a Tendency to alter their Qualities, are term'd Fermentative Liquors: But altho' the Word is orderly confin'd to signify such Liquors only as are daily observ'd to undergo Changes, viz. such as Beer, Ale, Cyder, some Wines, &c. yet it is plain it may with equal Reason be extended to all Liquors that are not entirely uniform and homogeneous, by reason all such are prepared to undergo the same or like Changes, although, not being so much in Use, they are not so much observ'd; for that Action or Operation that, in the above-recited Liquors, we dignify with the Title of *Fermentation*, is not any Thing different or distinct from that Motion that is inseparable from the Particles of all *Fluids*, but is really that very Motion, which only acquires this new Denomination when it becomes visible; for by the Means of this Motion, such Parts in Liquors that have the same Tendency, the same Size, and the same Figure, must necessarily congregate and herd together, because they agree in every Thing; whilst others in the same Liquor, that are neither under the same Degrees of Motion, nor have the same Determinations, nor the like Magnitudes nor Shapes, must as naturally be drove out and expell'd, because they thus differ in every Thing. And as this intestine Motion in such heterogeneous Liquors is term'd their *Fermentation*, so the Effect of this Motion in the same Liquors is called their *Despumation*; and this Despumation, which is only the Separation or Expulsion of the gross, unlike, and disagreeable Parts, always may be observed to succeed, according to the different Degrees of Motion in the minute Parts of the Liquors.

Such Fluids which, by reason of the Briskness of the Motion of their minute Parts, do usually in no very long Time refine or clarify themselves, do very frequently acquire a manifest Degree of Heat, which gradually vanishes as the Liquor fines, but may be continued by a frequent Affusion of fresh unrefined Liquor. And this Observation perhaps may yield us no improbable Hints for the natural Reason of the Continuance of that Warmth that is congenite to the *Blood of Animals*.

However, waving that, I am inclin'd to think, from a due Consideration of the certain Nature of *Fluidity*, and from Observations made upon several particular Bodies, that there are but few Liquors but will sooner or later undergo some Change by the Means of this Motion, that is, but will throw off some Parts that are not precisely uniform, and thereby undergo Changes in their Qualities; I say, not all, because Quick-silver, and some Bodies drawn by Distillation, seem to admit of an Exception. The purest Water will, if kept, plainly discover some dissimilar Particles lurking in its *CrySTALLINE Bosom*, which, before they can be entirely divorced, will so taint and stain that harmless and Virgin Liquor, as to make it loathsome to the Smell, and ungrateful to the Palate. It is true, these Changes in Liquors consisting of most uniform Parts, appear comparatively so very inconsiderable, as to pass often unobserv'd.

It may perhaps be thought, that what I have here said of the general Nature of *Fluids* can be to little Purpose, since I have already declared, that the principal Design of this Discourse is to inquire into the Nature of Diseases, which can relate to such only that are contained in our own Bodies, which are widely different in most of their Qualities, not only from those I have instanced in, but from all others that exist without an animated Body; and especially when I have already proved, that we have no Means whereby to learn the Natures of particular Substances, but by applying our selves to such for our Information. To which I answer, That although I acknowledge we can have no Certainty of the Natures of Corporeal Beings without Revelation, but as we are taught from them who are only able to reveal their own Natures; yet Analogy in such Things that are without the Reach of our Senses, is the only Means we have to regulate our Guesses: And in the present Case, I have only used Instances for such Ends as merely respect that Part only of the Nature of Fluids, which is common to all such as are seated in our Bodies, as well as such as are without it; for as to other Qualities, Powers, Effi-

cacies, Actions or Operations, which are many and great, wherein there appears no Agreement, I pretend not by such so much as to illustrate.

But the better to explain what I here intend, it will be convenient to remind the Reader what has been already proved from the same Author, *viz.* That there is always contained in the Body of Man common and appropriate Juices; and that of the first of these there are two Sorts, *viz.* *Blood* and *Spirits*; and that the *Blood* is the Source from whence not only all the appropriated, but even the *Spirits*, are separated.

We can no more doubt of the Existence of some *Fluid* that darts through the narrow Conduits of the *Nerves*, than we can of some Substance that is the Subject of Magnetical Properties, or of some Substances that produce Thunder and Lightning; since the Operations of the first in Sensation and organical Motion are as manifest as the last in the above recited Effects, and the immediate Subjects of both are equally invisible: For what can be more obvious, than that the Mad perceive and communicate Motion by the Help of somewhat passing in the Nerves, when both Sense and Motion are abolished whenever this Passage is intercepted? And what can be more marvellous, than that the Mind should distinguish so many different Perceptions by the Means of the same *Spirits*, being perhaps but only differently moved, or diversly modified in it, by outward Objects operating upon them.

By the two different Operations, *viz.* of perceiving, and imparting Motion, we come to a Knowledge of a twofold Use of this nimble Fluid, *viz.* as it is the Instrument of Sensation, and organical Motion. In the First, it seems only passive, in receiving Advice from without, which must be by their Motion inward, that is, from the Organ to the Brain. In the Second, it is active, by giving Motion by them to this or that Part, and in this their Motion is outward from the Brain to the Part.

But to render what follows the more intelligible, I must remind you, that the Motion of the organical Parts are of Two Sorts: The First of which is voluntary, as being under the Guidance of the Mind; the Second involuntary or vital, as being exempt from it. The First is what is performed by the external Muscles, whose Motions we can regulate at our Pleasure: The Second are in our internal Parts, as those in the Trunk of the Body, which we cannot as we please alter or restrain; Witness the *Pulse*, *Motion* of the *Stomach*, *Bowels*, and so forth. And indeed all such as do immediately contribute to Life, are not in our Power to alter, hinder or suppress; and those Motions that are inseparable from Life, seem to be effected by a Physical Cause; for the Spirits that are prepared for these Motions, are separated in a distinct Province of the Brain, and seem to descend in their Conduits, as they are separated from the Blood, to actuate the Organs besitt for these Uses: And the Blood is continued in Circulation by the Vibrations of the Heart, and the Heart is actuated and moved by the Influx of Spirits, and Life is seated in the Progression of the Blood; so that Life seems to run in a Circle; for the Motion of the Heart is made and continued by the Spirits, and by the Motion of the Heart the Blood circulates; and the Spirits communicating this Motion are prepared out of the Blood; so that the Spirits move the Heart, the Heart the Blood, and the Blood the Spirits; and in this Circle, so far as we are able to perceive, Life consists; because all those Functions that entitle a Body to what we call Life, immediately vary when the Motion of the Heart and Circulation of the Blood cease. The Spirits are the active Instruments to continue this vital Circle, the Heart being only an Engine to work the Blood, and the Blood such a Liquor that must be moved to be preserv'd.

But these Spirits, altho' by Nature destined for the most noble Uses, yet being prepared out of the Blood, will partake of its Nature; for when the Blood is vitiated and disorder'd, these Spirits appear depraved, and their Offices and Operations are irregularly and imperfectly executed; And because Life,

and consequently Health, which is only Life in Perfection, is founded in the abovementioned Circle; and because a certain Harmony between the Spirits, Organs and Blood, is required to continue that vital Circle; therefore if either of the *Triumvirate* fails, or is incapable to perform its Office, the Harmony suffers, and then Health is injured, and Life is gradually destroy'd: For if the Spirits are either depraved in their Temper, perplex'd in their Order, or wanting in their Number, they become unfit regularly to move the Organs; from whence the Blood flagging in Circulation, alters its Mixture. If the *Crisis* of the Blood alters, it becomes unfit to be moved, and incapable of yielding Spirits; and if the Organs are injured, it can neither receive nor communicate Motion.

But because all the Spirits, as well those employ'd in voluntary as vital Motions, are equally derived from the Blood; therefore when the Blood is depraved or alter'd, they both are equally incident to be affected with its Vices; as is particularly manifest in *Fevers*, in which the Spirits applied to both Motions appear in divers Instances equally affected; for those employ'd in Sensation and voluntary Motion are found incapable of performing either of them regularly, as appears, in that Perceptions are confus'd, from whence proceed *Deliriums*, *Phrensies*, &c. and organical Motions are prevented, as appears by the *Convulsions*, *convulsive Stitches*, *Tremblings*, restless and uneasy Motions, &c. And those employ'd in vital Motions fail likewise in theirs, leave the *Pulse*, sometimes alter, Breath varies, and the Motions and Offices of the Stomach and Bowels change.

Whosoever will but attentively consider what passes in himself, or but heedfully observe what happens to others, may easily perceive, that there is a natural State of the Spirits, which must consist in some just Temper, Order or Continuity of them, whereby they are besitt regularly to perform their natural Offices of Sensation and organical Motion: By reason it is most certain, that sometimes they do not regularly perform either

either one or the other; as we experience in those Diseases we call *Apoplexies*, *Epilepsies*, *Phrenesies*, *Deliriums*, *Mania's*, *Palsies* and *Convulsions*; in all of which, either Sensation or organical Motion is perverted or alter'd: And it is likewise certain, that we can discover nothing of the unnatural State of the *Spirits*, but as we can discern some Change, Hindrance or Disorder in these their natural and regular Functions, Offices, Uses or Ope-

rations, viz. of *Sensation* or *organical Motion*; we having no other Means whereby to learn any Thing of their Natures but by these; so that by weighing and comparing these, we are only taught to judge of their State, as whether natural and good, or unnatural and perverted, and their several Degrees. But these *Disorders* in their proper *Functions*, being in their Appearances very different, will be discuss'd in another Place,

R U L E S

F O R T H E

Practice of Physick.

By Sir *DAVID HAMILTON* Knt.
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OUR Author observes in his Preface, that, among other Things which lessen the Esteem of Physick, this is none of the least, That most of our modern Physicians apply themselves chiefly to study new Theories. Some adopt into their Schemes the Principles of *Aristotle*; others those of Atoms: Some the Principles of Chymistry; and at last we have those who have Recourse to the Principles of Mathematicks. And though all of them may in some Things have hit the Truth, yet their Way of Writing, and their differing from one another, creates a mean Idea of this most noble Art in the Minds of the Unlearned, as if there were nothing but Uncertainty, and no immutable Rules in it: Whereas if they would lay aside all Theories, except such as are founded on manifest Experience, and apply themselves principally to describe the History of Diseases both in dead and living Bodies, and the Vertues of sim-

ple Medicines, they might so adorn this Art, that its very Enemies would own its Excellency.

This is the Motive which induced him to set down some Rules for the Benefit of Students and young Physicians, which he has found successful in his own Practice; and by which 'twill appear, that the solid Fame and Excellency of a Physician does not depend on pompous Figments, or prescribing great Quantities of various Medicines, but on a Method of Cure, supported by an exact Knowledge of Diseases and Medicines.

This Treatise about the Practice of Physick is divided into Three Chapters. The *First* is of such as depend on the Honesty of the Physician: The *Second* is about the Rules of Art, and a thorough Examination of the Patient: And the *Third* is about the Method of Prescribing.

As to the *First*, 'Tis the Part of an honest and prudent Physician to be diligent in Vi-

sisting, and to prescribe according to the Indication of the Distemper; not to curry Favour, but in Consultations with other Physicians to behave themselves with Mildness and Generosity.

He advises against prescribing too many Medicines to procure the Favour of Apothecaries, or others, which for most part increases the Danger, as well as the Charge, of the Patient, leaves the Physician ignorant of the Nature of the Medicines, and adds nothing to his Fame.

Some, after the Manner of Empiricks, are for hastening the Cure all they can, either for Want of Skill, or from an Itch after vain Applause, without any Regard to the Issue of the present Distemper, or to another more dangerous or fatal that frequently follows it.

Others vary their Prescriptions too soon, either because they are afraid of tiring the Patient, or for fear they themselves should lose their Reputation by the frequent Use of one Medicine, by which they deprive themselves of knowing the Effects of their Medicines, and out of Complacency become Enemies to their Patients.

Nor are there wanting those who will not propose a better and approved Method, instead of what is commonly used, lest they should fall under the Censure of other Physicians, especially if the Patient should die under the extraordinary Method. In this Case, Sir David says, a Physician ought to arm himself against all Reflections; for as sometimes a Distemper prevails over the best Method, so at other times a Patient by Strength of Nature escapes under the worst: Therefore a Physician ought not to tie himself to any Man's Method; but to assert his Liberty to follow any that is founded on Reason, is speedier in the Cure, and fitter for enriching the Art.

He concludes this Head with advising Physicians to be prudently easy with one another; for as no Man knows every Thing, and that one sometimes remembers what another forgets, they ought to consider that the Life of the Patient is at Stake, and beware of staining their Hands with humane Blood; and says, he cannot forbear telling the World, that not a few have been lost by the Discord of Physicians.

In the *Second* Chapter, he says, the Characteristical Marks which distinguish a true Physician from the Herd of Quacks, is the finding out the original Distemper, and prescribing proper Medicines.

The Knowledge of the original Disease is come at by a thorough Examination, beginning from the very Time that the Patient's Health began to decline, and going over the Symptoms to the very Moment that the Physician was call'd.

A proper Prescription consists in the Choice of Medicines according to the Indications that appear on a thorough Examination, and a Physician ought, before he practises, to be well vers'd in the Knowledge of all Parts of Medicine, and bred up in Colleges appointed for that End.

Therefore not only Empiricks, who prescribe without Method, but likewise those who pretend to practise merely by looking into other Men's Receipts, ought to be avoided; since they are perfectly ignorant of the Principles and Symptoms of Diseases; as well as of the Method of Cure.

That which makes a thorough Inquiry into Diseases difficult, is the Imprudence or Forgetfulness of Patients in relating the Symptoms, which makes their Account confused and imperfect; and sometimes it happens by the Unskilfulness or Neglect of the Physician.

Of how much Consequence a thorough Examination into the Beginnings of a Distemper is, appears by the Failures of those that neglect it, and the Success of such as carefully practise it; who are thereby taught exactly to distinguish the Symptoms, and primary from secondary Distempers, with all their Motions, which otherwise are either unknown or confounded: But he who makes a thorough Inquiry, is able to propose a steady, plain, and therefore a more happy, Method of Cure, without having Recourse to a *Farrago* of Medicines, which is a certain Sign of a wavering Mind.

To illustrate this, he gives an Instance of a Gentlewoman he was called to in *January*, 1690. who had made Use of three able Physicians, but in vain; because they had not taken Notice of the primary Distemper, which was a Diminution of her *Menses*, but only observ'd the Symptoms, by which they

took the original Distemper to be a Phthisick: But he found upon Inquiry, that during her *Menses*, she was taken with a Nauseousness as eating Part of a Hare. This was follow'd by a Looseness, then by Diminution of her *Menses*, till they were quite stop'd, and then she fell into a Decay. Upon this Information, he laid aside all the Antiphthisical Medicines which had been prescribed by others, and prescribed as follows to provoke the *Menses*:

℞ Rad. Helenii, ʒj. Galangæ minoris, Calami Aromatici, ana. ʒß. Fol. Menthae, Melissæ, Absynth. Rom. ana. M. j. Semin. Fœnicul. dulc. Carui, Dauci, ana. ʒiij. Baccar. Juniper. ʒß. Cortic. exterior. Aurant. ʒß. Coquantur in Aquæ font. qf. in Vase optime clauso ad ℔ ij. addendo sub Coctionis Finem Vini albi, ℔j. Et Colaturæ adde Aq. Gent. comp. ʒij. F. Apozema. Capiat ʒiv. mane, & Hora quinta pomeridiana, Diebus continuis. Addantur singulis Haustibus Apozematis, Elixir. Proprietatis tartariz. Guttas xx. Et Tempore Haustibus prædict. interposito, sumat etiam quotidie Elixir. ejusdem Gutt. xx. ex Haustulo Potus ordinarii.

He says, that were he to prescribe in the like Case now, he would leave out the Orange Peel, because he has found by Experience that it stops the *Menses*.

By her sole Use of the Elixir in her ordinary Drink the 8th Day, her Vomiting was stop'd the next, and she kept what she eat. By the Use of the Elixir and Apozem together, the 15th Day her Vomiting quite ceased, her Appetite was strengthen'd, and her Stomach did not swell so much after Meals. About the 19th Day, her Costiveness began to remove, and her Feverish Heat and Pain in her Head to diminish. The 21st Day, she found Convulsive Pains in her Back; upon which he conjectured that the Time of her *Menses* drew nigh; therefore he forbade her the Use of the Elixir both by it self and in the Apozem, left by moving the Matter thro' the Intrails, the *Menses* should be stop'd; and that he might follow the Indication from the Pain in her Back, instead of the

Elixir, he added the following Things to the Apozem:

℞ Rad. Aristoloch. rotund. ʒj. Fol. Artemisæ, M. j. Sem. Levistic. ʒiij. Coquantur cum reliquis Ingredientibus pro Apozemate, & ante Apozematis singulos Haustus sumatur Bolus sequens:

℞ Borac. Venet. ʒj. Conf. Absynth. Romani, qf. ms. f. Bolus.

This he advised her to make Use of every Day during her *Menses*, which had very good Success.

The Third Chapter has the Rules of Prescribing. Sir David says, That when by a thorough Examination a simple Indication appears, for most part a simple Medicine is to be prescribed, for the following Reasons:

1. By this Method we come more easily and certainly to know the Specifick Vertue of Medicines than any other Way. Thus he himself first discover'd the Vertue of Orange Peels in too great a Flux of the *Menses*, for which it is so much commended by the Famous Riverius. Sir David prescribed the Use of it thus:

℞ Corticum Aurantiorum, N^o vij. Coquantur in Aquæ fontanæ ℔iij. ad ℔ij. & edulcoretur Colatura Sacchari alb. qf. ut f. Apozema. Sumantur Cochl. x. ter quaterve in Die.

This he found very successful, especially if nothing of the Placenta remain'd after Birth or Abortion, nor any Distemper in the inner Orifice of the Womb. This is a very efficacious and safe Medicine, when there is either a natural Efflux of Blood, or that 'tis occasioned by the Mouths of the Vessels being open'd, and is not attended with a Nauseousness, Loss of Appetite, Costiveness, or Head-ach, that usually follow the Astringents commonly made use of in this Case. He adds, That being ill spoke of by Physicians who used to prescribe costly Medicines, and Apothecaries who gain by them, as if he had been ignorant of the *Materia Medica*,

or careless of his Patient, he did (by the Advice of a Physician who was his very good Friend) add to this Prescription the Leaves of Hounds-tongue, and some other Things commonly reckoned to have the same Vertue, but not with equal Success; therefore he made use of a purging Pill with *Opium*, which, with the daily Use of the abovementioned Apozem for two Months, perfectly recover'd his Patient, after the Use of many other Things that had been prescribed to her in vain, and ever since he makes use of that Pill in the like Case.

2. By this Method we find out the best, quickest and surest of those Medicines to which Physicians ascribe the like Vertue; as we experience the Bark of *Peru* by it self to be the most effectual of all other Bitters in Intermitting Fevers, provided the Patient be prepared by Vomiting or Purging; for many times an Intermitting Fever is more certainly cur'd by Salt of Wormwood, used in Conjunction with Emeticks, and Blisters, if need be, than by a precipitant Use of the *Cortex*; so that where a Cure may be speedily effected, it is to be endeavour'd, to vindicate Physicians from the Charge of Avarice or Ignorance, and to save the Lives of their Patients; for many are lost, not by the Obstinacy of the Distemper, or the Ignorance of the Doctor, but by their Aversion to repeat the Use of Medicines.

3. In prescribing simple Medicines, it will be of great Use so to compound them, as they may aptly suit the various Indications, and those are to be selected whose Vertues we have already experienced; for he asserts from his own Knowledge, and brings Instances to prove it, that the same Medicines have had different Effects according to the Nature of the Composition, or the Time of administering them.

4. By this Rule Physicians learn to prescribe proper Medicines, not only in various, but even in contrary Indications, of which he gives Instances from his own Practice.

5. By this Method of prescribing simple Medicines to simple Indications, a Physician learns rightly to apply the same Medicines to different Distempers, which he illustrates also by Examples.

6. By prescribing Simples, their hurtful

Qualities are more easily discern'd, and by Consequence avoided, lest the curing of one Distemper beget another. For Instance: In such as are inclinable to a *Diarrhœa*, either when before the Use of the *Cortex* the morbid Matter begun to discharge it self by Stool, or did so abound as to provoke to Stool, the *Cortex* has not only a provoking Quality, but is capable of occasioning a *Diarrhœa*; therefore by a too hasty Use of it, without the Preparations abovementioned, the Patient becomes more liable to have a Relapse of the *Intermitting Fever*; so that if the Effect of any Simple be such, by this Method the Physician is taught what contrary Medicines are to be made use of.

Sir *David* adds, as an Appendix to this Part, That it would be of great Use to the finding out the Nature and Issue of Distempers, and proper Medicines for them, if Persons deceased were more frequently dissected, and the History of the Distemper wrote by the same Physician; for it is not to be doubted, but we may have great Light from the Observation of the Organical Parts and Humours, and even from the Defects in the Blood of those who die of Fevers, or other Diseases.

The next Treatise in this Book is about the *Febris Miliaris*, or a Fever attended with Blisters on the Skin.

He chose to write on this Subject; because, 1. No Physician has treated of it at large; and though *Etmuller* has a Chapter about it in Child-bearing Women, it differs very much from our Fever of that Name. 2. Because it frequently turns to a chronic and fatal Distemper, by the Neglect of Patients, who do not regard it at first, by its Continuance, or by the Physician's mistaking of its Symptoms, or forbearing their Visits too soon, for fear of being charged with Avarice, and prolonging the Cure. These are the Reasons which induced him to write this Treatise from his own Observations, for the Use of young Physicians, and that he might excite those who are experienc'd to publish theirs in like Manner. To this Treatise he has added an Historical Collection of the several Sorts of this Fever, wherein he has religiously adher'd to Truth.

The Treatise consists of Nine Chapters.

Chap. I. *Treats of the Name, Kind, and Species, of the Distemper.*

Some derive the Name from the *Blisters*, which resemble *Millet-Seed*, and appear chiefly in the upper Parts of the Body; but he thinks it ought rather to be called *Febris Vesicularis*, or a Blister Fever, because the Pimples or Pushes are like Bladders, first with a limpid Serum, than fill'd with whitish Matter not unlike Pearls.

He observes that some reckon none but pestilential and petechial or spotted Fevers to be malignant; but he differs from them, and assigns to this Class, 1. All Fevers that spread by Contagion; 2. All Fevers that begin with violent Pain in any Part of the Body; 3. Those in which the Animal Spirits are suddenly oppress'd, and such as occasion sudden Death; and all these Symptoms he has observ'd in the *Febris Miliaris*, which, he says, is as fatal to the *Indians* as the *Petechial Fever*.

The *Febris Miliaris* is Simple, or Compound: The Simple is when nothing but the *Blisters* breaks out, and of this Sort he treats here: The Compound is when with the *Blisters* red Wheals or Pushes are mix'd, which when alone are commonly called a *Rash*. Sometimes the *Blisters* are mix'd with the *Small-Pox*, and dry up by Degrees as the latter swell, but continue after the red Pushes dry up.

Chap. II. *He describes the Febris Miliaris, by its Antecedents, Concomitants, and Consequents.*

The Antecedents are a weak Constitution of Body, either natural, or occasioned by excessive Evacuations, or a too spare Diet; the Blood is too serous, the Mind fearful and weak, and easily affected by outward Objects, as in Women and effeminate Men; Pensiveness, and deep Thought or Melancholy. An Obstruction or Ulcer in some Part, with much Pain. From whence, those who labour under a long Cholick, the Stone, or an Ulcer in the Reins, and Gout, are much subject to this Fever. In Women 'tis preceded by an inward Heat, either with or without Thirst, especially about the Time of Child-bearing, which occasions the Child-

bed Pains to be less violent, and the Spirits are depress'd without any evident Cause, with an Oppression in the Breast that occasions Sighing; and it is likewise preceded, as in other Fevers, with an external Cold.

The Concomitants are Cholick, Nephritick, Pleuretick, or Rheumatical Pains, almost as violent as those of Child-bearing, with an Oppression of the Breast, and Sinking of the Spirits. After these Pains cease two or three Days, they are succeeded alternately by Shiverings of the whole Body, Cold and Heat, but the latter not so violent as in common continued Fevers, the Palm of the Hands being much hotter than the Back of 'em, the Pulse quick, but weak, the Spirits fail much, and occasion Sighing, as if the Breast were oppress'd with a great Weight, Sleep steals upon the Patient, but is suddenly interrupted, which is the most constant of all the other Symptoms. Many Times they pass several Nights and Days without Sleep, and yet are neither delicious nor troubled with the Head-ach, as he says he knew a Woman in this Distemper who did not sleep for a whole Month. The Tongue is sometimes cover'd with a white Thrush, at other Times looks well. The Urine is now and then as pale as Water, and sometimes has its natural Colour, by which Symptom young Physicians are frequently deceived, and ascribe it to Vapours. The Stomach is sick after Sleep, and the Patient now and then has a *Diarrhœa*, either by their own Neglect, or the Unskillfulness of the Physician, who prescribes hot Things, as usual in Hysterical Fits, without *Diaphoreticks*. At other Times the Patient is costive, and then troubled with a Loosness, Sickness in the Stomach, and Pain in the Intrails. Sometimes they have a great Thirst, and at other Times little; and their Hands and Tongue tremble, so that they speak as if they shiver'd. They are often troubled with convulsive Motions, *Deliriums*, and Difficulty of Breathing, and these Symptoms return with greater Violence, like the Fits of an *Intermitting Fever*. The Oppression of the Breath, attended with Sighs, or a great Defect of the Spirits, without any evident Cause, Want of Sleep, and a Commotion of the Spirits, commonly called a *Harry in the Head*, when the Patient composes himself to Rest, a quick and weak

weak Pulse, join'd with any other Symptoms, do always foretel the Breaking out of the *Pustule Miliaries* or Blisters, continue till they appear, and then for most Part the Patient is freed from those Symptoms.

These Blisters do for most Part break out in the Breast, Neck, and betwixt the Fingers, sometimes on the whole Body, and increasing by Degrees vanish at last, leaving the Skin rough. Sometimes they itch in a *Complex Fever*, where the *Red Pusles* are mix'd with the Blisters. 'Tis observable, the more simple this *Fever* is, the Symptoms are the easier, which frequently occasions a Neglect, both in unwary Physicians and Patients, so that the *Fever* becomes either more dangerous, or is followed by another Distemper.

In the Declension of this Distemper, the Backs of the Patients Hands are frequently wet with a cold Sweat.

'Tis difficult to tell the certain Time when those Blisters appear, because the first Beginning of this Disease, and the Accounts given of it by Patients, are so uncertain; but to the best of the Author's Observation, they break out for most Part about the 11th Day of the *Fever*, proceed regularly, and dry up about the 18th, or, if the Matter abound, the 21st or 22d.

The Consequences of this *Fever* he reckons the Swelling of the Thighs, Legs and Feet, sometimes with Pain; Swellings and Imposthumes in the Teats, Decay of Memory, a too great Flux of Child-bed Evacuations or Urine, *Hypochondriac* or *Histerical Fits*, inward Heat and Weakness, attended with Languishing and Decay of Appetite. These or some of them are the Consequences, either from the Malignancy of the Distemper, or the Unskilfulness of the Physician.

Chap. III. *Is about the Internal Causes of this Fever.*

Sir David supposes them to be from too much *Serum* in the Blood or nervous Juices, and a certain Acrimony proceeding from too much Commotion of the nervous Juice. The Secretions peculiar to this *Fever* prove the Acidity of the Blood, for the Urine in this Case is not so high coloured, but looks more healthful, and is more plentiful than in *Burning Fevers*, when the Blood and nervous Juice is impregnated with *sulphureo-*

saline Particles: The Flux of Spittle is greater than in a *Burning Fever*, the Thirst less, and the Tongue not so much furr'd; the Blisters are fill'd with *Serum*, separated from the acid Humour; and this appears likewise from the testaceous absorbing Medicines, such as Crabs Eyes, &c. which are good in this Distemper; and also from those Acids which are hurtful in it, as Lemon Juice, &c. The Serosity of the Blood is also proved from the Heat, which is not so great as in a *Burning Fever*: For when a Rash is mix'd with the Blisters, the *Fever* is more burning, and those who are troubled with the Dropsy called *Anasarca*, have their Blood full of *Serum*, and tho' they sometimes have the *Febbris Miliaris*, and the nervous Symptoms, they are seldom troubled with a *Burning Fever*. This is also proved by the Time of the coming out of the Blisters, which, because of the Serosity of the Blood, and the lesser Heat, don't appear so soon as the Rash or the Small-Pox, where the Blood abounds more with Sulphur. For this Cause it is that the Animal Spirits are first affected in this *Fever*.

This is also proved by the Medicines made use of against this *Fever*, viz. the successive Application of *Diaphoreticks* and Blister Plaisters, which diminish the *Serum*, and sweeten the Acid. Besides Nature cures this Distemper, by spending the *Serum* in the Blisters when they come out. Nor are diluting and watry Liquors so useful here as in a *Burning Fever*, when Chicken Broth is to be plentifully drank. Besides all Things which hinder the Lessening of the *Serum* by Sweat, as outward Cold, and hot Medicines that are not *diaphoretick*, are hurtful in this Distemper. The Serosity and Acidity of the Blood appears also by the dissected Corps of such as die of this Disease.

That the Distemper first begins in the nervous Liquor or Animal Spirits, is plain from the nervous Symptoms, which are the first that appear in this Case, as Pain, Depression of the Spirits, Wakefulness, &c.

Chap. IV. *Treats of the Causes of the Symptoms.*

Most People, says the Doctor, think, that a continued acute *Fever*, if it be not malignant, proceeds from an Obstruction of the

the *Glandules*, especially those called Cutaneous, and of the Fulness of the Blood Vessels which arise from thence; so that 'tis likely the same happens in this Distemper to the nervous Juice; for as the Nerves are extended by the Obstruction, the Pain, which is the first Symptom of this Distemper, arises from that Extension; and therefore is better eas'd by *Diaphoreticks*, which diminish the *Plethora* and Obstruction of the *Capillary Nerves*, than by *Landanum*.

The nervous Juice being augmented by the Obstruction of the *Capillary Nerves*, and repel'd in its Course, gives an irregular Motion to the Animal Spirits, and makes the Patient shiver.

Heat succeeds the cold Fit, by a more plentiful Transfusion of the nervous Juice into the *Blood*, when the Obstruction is remov'd. This occasions a quicker Motion of the Blood, which abounding with serous acid Parts, that restrain its Motion, the Pulse is not so high as in other Fevers occasioned first in the Blood it self, where saline and sulphureous Particles luxuriate.

The hot and cold Fits follow one another irregularly, which proceeds from the Serosity of the Blood, and of the nervous Juice separated from it, which are thereby sooner affected, by Medicines, the Motion of the Body, much Speaking, or the Passions of the Mind. Therefore nothing can contribute more to stop the Irregularity of the hot and cold Fits than lying in Bed and Rest.

The Oppression of the Breast and Sighing proceed from the Stagnation of the nervous Liquor in the capillary Nerves of the Breast, of which the Patient is eas'd as soon as the *Blisters* come out. It certainly does not come from the *Serum* in the remotest Branches of the *Aspera Arteria*, for that would occasion an Asthma, and the Oppression would be removed by pectoral Medicines, which are of no Use here, nor are any other that hinder the Coming out of the Blisters.

This Oppression is attended with a sinking of the Spirits, because of the Serosity of the Blood, and the lesser Separation of the Spirits into the nervous Juice. It proceeds also from the Serosity of the nervous Juice that burdens the Spirits; for when the Serum is diminish'd by Sweating, the Animal Spirits are at Liberty, and the Patient recovers

Strength. 'Tis also observable, that in this Distemper the Pulse is the same when the Spirits sink and when they are at Liberty; but when there's too great an Evacuation, the Weakness of the Pulse answers to the Sinking of the Spirits.

By a too great Motion of the Animal Spirits, they cease from Sleep, and are frequently delirious; and when that they compose themselves to Sleep, they complain of an inward Confusion of their Senses.

When their Head is without Pain, tho' they don't Sleep, 'tis occasioned by the Blood's flowing towards the Brain with less Force; for tho' the Circulation be quicker than when in Health, 'tis slower than in other Fevers, and their Thirst less: For the same Reason their Urine is pale, and more plentiful, and they spit more frequently.

From the Serosity of the Animal Spirits, the opposite Muscles are not always equally contracted, from whence proceed convulsive Motions; but if by the Serosity above-mentioned the Contraction of the Muscles be weaker, then they have only a Trembling in their Hands and Tongue.

In the Beginning of this Distemper, if the Patients being deceived take it for Vapours, rise out of Bed, and use hot Medicines, it increases the Motion of the Blood and Spirits, and instead of the Blisters Nature provokes to an untimely, and irregular Secretion of the Morbific Matter, from whence proceed various Symptoms, according to the various Parts it falls upon, and the Fever lurks under the Disguise of some other Disease. If it fall upon the Stomach, it occasions Nauseousness and Vomiting; if on the Entrails, Pains, and a *Diarrhæa*; which are sooner eas'd by a continued Sweat, than by *Landanum* or *Astringents*; and if there happen only two or three Stools, without Gripping or Sinking of the Spirits, Sir David forbids the Use of Astringents and Opiates, because frequently there's Matter enough to be voided both by Stools and Blisters, therefore Stools don't hinder their coming out.

In the last Place the Pulse becomes weak by the Serosity of the Blood and of the nervous Juice, and then by the Paucity of the Animal Spirits, and the looser Systole of the Heart.

Chap. V. *Treats of the Prognosticks in this Distemper.*

If the Patient has not observed a good Regimen at first, and the Physician has prescrib'd hot Medicines, that don't provoke Sweat, tho' the Symptoms have been mild at the Beginning, the Distemper frequently grows worse, and threatens either Death or the Length of the Disease.

If from the first any Part have been affected with Pain, the Patient hath been hot without Pain, or his Stomach sick, and afterwards the hot and cold Fits come alternately, but at unequal Distances, if there happen also a Sinking of the Spirits, and an Oppression of the Breast with Sighing, and an easy Respiration, and at last the Blisters come out with a soft and continued Sweat, the Patient is in a fair Way.

A *Delirium*, *Convulsive Motions*, or an *Apoplexy*, if by the inseparable Signs of this Distemper, viz. a great Oppression of the Breast, with Sighs, and a Sinking of the Spirits, they seem to be concomitant Symptoms, and happen at the Beginning, they may be removed by Diligence and a regular Application. But if in the Progress and Declension, where the Patient is weak, and the Blisters sink in either by Cold or unskilful Application, they are fatally transpos'd to the Brain and the Nerves, and soon followed by Death.

In this Fever, a sudden Suppression of the *Diarrhœa*, whether of it self or by the Misuse of *Astringents* or *Opiates*, it betokens an *Apoplexy*, especially if the Distemper be attended with a *Plethora*, and the opposite Structure of the Parts.

Urine of a Citron Colour, which suddenly turns pale, is a Sign of a dangerous *Metastasis*.

A *Diarrhœa* is a dangerous Symptom to Women in Child-bed, for it not only hinders the coming out of the *Blisters*, but stops the Child bed Evacuations.

Difficulty of Breathing and Speaking, the Trembling of the Tongue, but especially Purfliness, occasioned by an Affection of the Nerves, are very dangerous Symptoms.

The more sleepy the Patients are, the more easily are they cur'd.

Those of a meek Temper recover better than such as are of a fierce and rugged Disposition.

If Nature and the Physician co-operate, the Patient recovers as soon as the *Blisters* dry up, except through the abundance of the morbidick Matter the Remainders fall upon some particular Part of the Body.

In a *Scarlet Fever*, if the *Blisters* come out after the Red Colour is gone, 'tis a good Symptom.

Chap. VI. *Is about the Cure of the Simple Febris Miliaris.*

Sir David prescribes the Sweetening of the Acidity of the Blood and nervous Juice, the Diminishing the *Serum* of 'em, and the restoring or freeing of the Animal Spirits, by which Method the dangerous Symptoms are remov'd, and the Motion of the Blood and Spirits is brought to an *Equilibrium*; and this being done, the *Blisters* or *Pimples* are to be expected in the usual Time.

To sweeten the Blood and nervous Juice, Alcales, and chiefly Testaceous Medicines are to be applied, as Crabs Eyes, Pearl, and the like. To diminish the *Serum* at the same Time, and also to promote a continued Sweat, *Goa Stone*, the Bezoar Stone, and Powder of Crabs-Shells, the Use of 'em for some Days corrects the Faults of the Blood and nervous Juice, makes the Pulse stronger and more even, and hastens the coming out of the Blisters. If there be no Occasion for Sweating, but only to heighten the Blood and Animal Spirits, hotter Cordials, as *Virginia Snake-Root*, and the like, or Wine taken plentifully; but these Things seldom take Place in this Fever for driving out the Blisters; for a more vehement Fermentation of the Blood, and a contemporary Secretion of the morbidick Matter, don't well agree, and the Use of hot Medicines frequently occasion *Deliriums*, *Convulsive Motions*, and the like. Therefore all *Secretions*, whether made by Nature or Art, are best when they proceed slowly. This is proved by the Use of Testaceous Medicines, which together nourish a moderate Heat, sweeten the Blood, and promote Sweat.

To lessen the *Serum*, *Blisters* are of great Use, and likewise hinder the Coagulation of the Blood by their *Volatile Salts*; therefore no other Medicine does better settle the Motion of the Animal Spirits, promote Sleep, or eases depress'd Spirits; for the morbidick Matter being thus in some Measure diminished, Nature more easily discharges the rest in its usual Way, so far is this Method from hindering the breaking out of the *Blisters*. Nor are Blister Plaisters to be applied only once, but again and again, unless some great Symptom forbid it, and as soon as one Blister is dry'd, another ought straightway to be rais'd; for Sir David has often observ'd, that all the Symptoms have grown worse after the drying of the first *Blisters*, but have abated upon the applying of new ones.

Purging Medicines are seldom to be used in this Distemper, unless some great Symptom require it; but there's often Occasion to cleanse the first Ways by emollient Glysters.

Letting of Blood is seldom to be practis'd in this Case, unless some very pressing Symptom require it, such as an *Asthma*, a *Pleurisy*, or the like.

The Passions of the Mind are to be avoided in this Distemper, and all that puts the Animal Spirits in Motion, whether pleasant or unpleasant, are hurtful; and keeping in Bed is to be injoin'd the Patient: For by the contrary *Regimen* in the Beginning of this Distemper, the Matter of the *Blisters* being struck in, produces other dangerous Symptoms; and if other Medicines be applied to those Symptoms than are proper for the original Disease, either Death or a chronical Distemper follows, and the *Blisters* never come out. Hence it is that Women in Child-bed do more easily recover of this Distemper, because by keeping in Bed they procure a gentle and perpetual Sweat, and are nourish'd by Juicy Food instead of hot Medicines; for it has often been observ'd, that those who found themselves well in Bed, have fainted and been ready to die when they got up, and some have drop'd off suddenly; and such as leave their Beds too soon, taking the Distemper to be only hysterical Fits, have grown worse. He gives an Instance of a Gentlewoman who did so,

but being call'd to her when ready to die away, he order'd her immediately to be put to Bed, a Blister Plaister to be apply'd betwixt her Shoulders, and the following Bolus to be taken with a Julep every six Hours.

R Pulv. e Chel. Canc. comp. Spermat. Ceti, a. ʒ j. Croci, gr. vj. Syr. Paralyf. qf. ms. f. Bolus; which cured her in a few Days.

He gives other Instances of those who died by leaving their Beds too suddenly, for which we refer to him.

Chap. VII. Is about Curing the Symptoms of this Fever.

He is of Opinion, that the same Medicines are to be apply'd to each Symptom as if they appeared singly by themselves, unless some Symptom teach the Contrary, which a skilful Physician will consider.

The Pain in the Head or any where else, is much better remov'd by a gentle and continued Sweat, than by Opiates. As in petechial Fevers, and the small Pox, the Pain is not to be remov'd till the Matter to be expell'd break out in the Skin; so when he is call'd to Women in Child-bed, or troubled with any other Pain, and perceives a sinking of the Spirits, and a quick but weak Pulse, he omits Hypnoticks, and orders Diaphoreticks, but if the Violence of the Pain requires Opiates, he orders them to be mix'd with the other: Otherwise they either don't remove the Pain, or occasion some Mischief in its stead. If the Pain be Pleuretic, or there be any Inflammation, he advises the Letting of Blood.

As often as the hot or cold Fits return irregularly, as for most Part they do, a gentle Diaphoretick compos'd of *Pulv. e Chel. Cancr.* are very useful if taken without hot Things; and though this Medicine be condemn'd by some, he has frequently found it very successful.

Want of Sleep is help'd, by applying *Blistering Plaisters*, keeping in Bed, removing all Noise, and avoiding Uneasiness of Mind.

Diaphoretick Antimony taken alone is very good against a *Delirium*, and though

this be despis'd by some Physicians, he has often found it successful both in Want of Sleep and *Delirium*.

Want of Sleep is also frequently cured by a gentle and continued Sweat; and if the abovementioned Powder don't procure it, Spirit of Hartshorn is to be preferred before all other Things; and 'tis better to take it in Sage Posset Drink, than in Infusion of Sage, because the former is more nourishing, and therefore more necessary in this Distemper.

If *Opiates* be used in this Distemper, they are best after *Blistering*; and when the Patient has a *Diarrhœa*, or the coming out of the Pimples is stop'd, *Conf. Fracastor.* or *The-riaca Androm.* are of special Use.

For Convulsive Motions, he never found any Thing better than to appoint all the Joints with Essence of Amber, and giving about twenty Drops of it in any convenient Liquor frequently.

When the Breast is oppress'd with Sighing, especially if attended with a *Convulsive Asthma*, a gentle and continued Sweat, Spirit of Hartshorn, and Blisters, are exceeding useful.

In the Sinking of the Spirits, he found nothing better than Treacle Water, either alone, or in a Vehicle with some Drops of *Sal volat. oleos.* and Powder of Saffron, especially if attended with the Palpitation of the Breast.

In Shivering or Trembling, the Animal Spirits are to be cherished with apt Medicines, especially Saffron; and nourishing Broths, especially that of Chickens.

In an universal Convulsion, occasioned by the striking in of the morbidick Matter, he has found letting of Blood by Cupping-Glasses very successful, and at the same Time order'd warm volatile Spirits to be taken by the Patients, and Glisters to be administer'd.

When the Patient is sick with a Nauseousness, and a Heat in the Breast, 'tis a Sign of the Pipp's coming out on the Tongue. These Symptoms are eas'd by a continued Sweat, till the Tongue be cover'd with Pipp's; and 'tis to be observ'd, that the Blisters dry up at the same Time when the Pipp's increate; and on the contrary, when the Pipp's wear off the Tongue, the *Blisters* strike out, and sometimes the Remainders of the Fever serve to

nourish the Pipp's after the Blisters are dried up.

Against Vomiting, he adds to a Scruple of Powder of Crabs Shells ten Grains of Salt of Wormwood, especially if the hot Fits return by regular Intervals; except some Symptom, as the Inflammation of the Almonds, which is augmented by Lixivial Salts, dissuade from it.

In *Diarrhœa's*, which he finds often to be augmented by Astringents, or if removed, are attended with worse Symptoms, he prescribes Blisters with good Success; by which, and the Use of Diaphoreticks, the serous Matter is revuls'd from the Glandules of the Intestines. He also prescribes a Scruple of Pearl by it self, or to be taken several times in some convenient Diaphoretick.

In *Chronical Diarrhœa's*, he has often found *Blistering Plasters* to be very effectual, and gives several Instances of it.

Chap. VIII. *Treats of the Febris Miliaris Composita, which he describes to be when the Blisters are mix'd with a Rash, the Meazles, or Small-Pox.*

The Symptoms are almost the same as in a Continued Fever; but the Patients are more oppress'd with the Sinking of the Spirits and Sighing; they are troubled with Want of Sleep, and their Urine more like that of healthful Persons.

In a Fever with red Pusles, sometimes the *Pustula Miliars* are not only mix'd with them, but continue when they are almost dried up. In the Meazles and Small-Pox, the *Blisters* generally go before, and attend them in the Beginning.

In this Complex Fever, the Symptoms discover rather the Defects of the Blood, than of the Nervous Juice. The Pulse is quick and high, the Heat great, the Tongue dry, and the Thirst immoderate; but the Sinking of the Spirits, and frequent Sighing, are common to both Fevers.

As to the Cure where the *Pustula Miliars* accompany the Meazles and Small-Pox, *Diaphoretick Medicines* a little hot are safer than in the Small-Pox alone.

Outward Cold, or a cold Regimen of any Sort, is dangerous, and sometimes occasions sudden Death, even when most of the Symptoms promise a good Issue.

There-

Therefore hot *Opiates*, as *Diafcoridium*, and the like, are more successful than *Diaacodium* or *Laudanum*, as often as the *Blisters* are join'd with the Meazles or Small-Pox.

Chap. IX. *Is about certain Diseases which succeed this Febris Miliaris.*

There are Two which Sir David takes more special Notice of, *viz.* a Swelling of the lower Parts, and a Hectical Heat.

The Swelling of the Feet and Legs, and likewise of the Thighs and Groin, often happens without, but for most part with, great Pain, which precedes the Swelling which happens by the Remains of the morbidick Matter in these Fevers that have not been well cured.

He prescribes for this purging Pills, to be taken with *Opium*, or some Opiate every Night. The Opiate he uses is a Pill *de Cynoglossa ad 3 B.* and he chuses the purging Medicine according to the joint Indications. For Instance: When the Appetite and Digestion are weaken'd, *Stomach. Pill. ad 3 B.* When Childbed Purgations or the *Menses* are suppress'd, he uses the *Pillula Aloephagina* or *Fætida*, and sometimes adds four or five Grains of the *Resina Jalap.* and orders a Draught of the bitter Decoction without *Sena* twice per Day. If there be Need of stronger Catharticks, he prescribes them every Night, with some Stomachical Decoction to be taken by Day.

But if the Swelling be without Pain, he uses Catharticks without Opiates; or if it attend the *Febris Miliaris* only as a Symptom, 'tis dissolv'd by a Continuation of Diaphoreticks.

The Spirit of Scurvigrafs, both simple and purging, is very useful in this Case, of which he gives several remarkable Instances.

A Hectical Heat, Loss of Appetite, and Want of Vital Spirits, do frequently succeed the *Febris Miliaris*, especially if the Patient get up too soon. In this Case he prescribes, *Salis Absynth. gr. x. or xv. ex Aquæ Spadane Haustula*; and then by Degrees two Pounds of the same Water, especially if the Spirits sink; and otherwise, two Pounds of Bath Water, that the Remains of the Acidity left by this Fever may be voided together with the abovementioned Water and

Salt. If the Head be offended by the Use of Salt of Wormwood, he orders some Lenitive Medicine to be taken every third or fourth Day when the Patient goes to sleep. In this Case the Patient must eat nothing salt or acid, and take Care of too great Exercise of the Body or Mind, for fear of a Relapse, which is also frequently occasioned by a precipitant Use of the *Cortex Peruvianus*; in which Case he has prescribed Asses Milk, and Testaceous Powders, with good Success.

The rest of the Book, which makes about one Half of it, is an Historical Account of the several Sorts of the *Febris Miliaris*, with the Methods of Cure from Instances of his Patients. There are 17 of these Historical Accounts, of which we shall only give the Titles, and the 6th Instance, which is the most remarkable of the whole.

1. The History of this Fever, with an Apoplexy.
2. With a Palsy in the lower Parts.
3. With a *Delirium* and Convulsive Motions.
4. Which ended in an Apoplexy by the Use of *Opium*.
5. Which ended in Death by the Patient's catching Cold.
6. Where there was a strange *Deliquium Animi* for two Days.
7. Which ended in a Chronical Distemper.
8. Which was attended with a Chronical Distemper, and issued in Death.
9. With a very large Efflux of Urine towards the End of it.
10. Which concluded with an Imposthume in the Breast.
11. Which was contracted by Cold, and proved mortal.
12. Attended with a most violent *Delirium*.
13. Attended with Loss of Memory.
14. Which proved fatal by taking an Emulsion.
15. Attended with an Ulcer, and Stone in the Kidneys.
16. Attended with the Small-Pox.
17. Which proved fatal, the Patient having lost his Voice at first.

The 6th Instance abovementioned is as follows:

Sept. 12. 1697. Sir David was called to Mrs. Hall, at the Leopard in Blackman-street near St. George's Church, the 9th Day after she was brought to Bed. She was in the 38th Year of her Age, and this was her 6th Child. Her Constitution was weaken'd by her constant hard Labour in Child-bearing, and a frequent Colick which she had lately been afflicted with, attended by hot and cold Fits, an Oppression in her Breast, and a Sinking of her Spirits. Those about her called it *Vapours*, and under this Name it went till the Day the Child was baptized, when being overcome with the Noise of the Company, her weak Spirits were mightily disturbed, and she was seiz'd with Trembling and Convulsions, and so very uneasy, that her Husband could scarce keep her in Bed. The Day before Sir David was called, she was taken with an universal Convulsion, and lay like one dead. When he came to see her, about 9 in the Morning, her Husband thinking her dead, left Orders that Sir David needed not trouble himself, and that he should not be admitted to see her if he came; but Sir David urging the contrary, he came into the Chamber, and holding a Looking-glass to her Mouth and Nostrils, found no Manner of Breath. She was as pale as Death, and lay stretch'd out upon the Bed, without any Motion: But upon Inquiry of those about her, he conjectured, that this seeming Death proceeded from a Translocation of the morbidick Matter into all her Nerves; for he remember'd, that in little Fishes inclos'd in a Glass, and view'd by a Microscope, the Circulation of the Blood was visible, tho' the Fish seem'd to be dead. He thereupon forbade that the Bed-Clothes should be taken off her for some Days, or that they should bury her till the 7th, and with much ado prevailed, that Cupping-Glasses with Scarification should be applied betwixt her Shoulders, and on the Inside of her Thighs; that Blistering Plaisters should be put behind her Ears, and upon her Wrists; that her Temples, the Palms of her Hands, and the Soles of her Feet, should be anointed with Oil of Amber; that the Juice of White Betony, and a Powder made of Hellebore, Sage, and Flowers of Betony, should be

blown into her Nostrils alternately; and a Draught of *Aq. Laet.* ʒ iij. *Castor.* gr. vj. *Syr. Ariem.* ʒ vj. and an Apozem should be thrown into her Mouth, if possible, made as follows:

℞ *Rad. Fragar. Chelidon. major.* an ʒ j.
Fol. Fragar. M. ij. *Flor. Paralalyseos,* p. ij.
Sem. Cardui Benedict. ʒ j. *Bulliant.* in
Aq. font. qf. ad ℥ ij. *Colaturæ adde Syr.*
Croci, ʒ j. *ms. f. Apozema, de quo sumat.*
Cochl. x. sape in Die.

Almost two Days after, viz. on the 13th, about 4 in the Afternoon, the Servants who came to Sir David told him, the Surgeon, as soon as he saw the Patient, ask'd with Amazement, why they would have him apply Cupping-Glasses to a dead Woman; but obeying his Orders, he applied them to her Thighs, but not to her Shoulders, she was so very stiff. He also put the Blisters to her Wrists. In the Evening, tho' there was no Sign of Breath, she began to grow a little warm, and Sir David order'd, *Cranii Humani,* ʒ j. with *Aq. Rut.* and *Syr. Artemisæ,* to be put into her Mouth. On the 14th, about 4 in the Morning, she began to breath gently, and to swallow down. He again prescribed the Blisters to be applied betwixt her Shoulders, and that *Gutt. xx. Sal. volat. oleos.* should be given her by it self: Upon which, the *Pustula Miliare*s began to appear, and to make them come out, he prescribed:

℞ *Pulv. e Chel. Cancr. comp.* ʒ β. *Sumatur quarta quoque Hora e Cochl. j. Julapii sequentis, superbibendo Cochl. iiij.*

℞ *Aq. Cinam. Hord.* ʒ iv. *Rutæ,* ʒ iij.
Pæon. comp. ʒ j. β. *Sacchar. albiss. qf. ms. f. Julapium. Et ut bibat de Apozemate ex Ung. Aleis pro Potu ordinario.*

The 15th Day she began to move and speak, and complain'd of her Blisters; the *Pustula Miliare*s came out in great Numbers on her Breast, and he continued the abovementioned Prescriptions.

The 16th the *Pustula* grew much bigger, and she came to her Understanding, was freed from the Oppression of her Breast, and her

her Faintness; but continuing weak, he prescribed as follows:

℞ Pulv. e Chel. Cancr. comp. gr. xlv.
Aq. Lact. Alex. ℥ ij. β. Epidem. ℥ ij. m℥.
f. Haustus sexta quaque Hora sumendus.

℞ Rad. Scorzon. Hisp. ℥ j. Cort. Aurant.
Cind. ℥ vj. Fol. Galengæ, Meliss. an. M. j.
Flor. Cord. an. p. j. Sem. Card. Benedict. ℥ β.
Coq. in Aq. font. q̄s. ad ℔ j. β. addendo Colaturæ Syr. Limon. ℥ j. m℥. f. Apozema, de quo sumat Haustum ad Libitum, & in Languoribus Aq. Theriacalem.

The Patient continuing pretty well, he did not visit her till the 19th Day, and then only prescribed some bitter Stomachicks to sharpen her Appetite, that after the 4th Night she should take the *Tinctura Sacra*, and next Day *Stretham Waters*, by which she recover'd to every one's Admiration. By lying too much on one Hip during the Fever, she had a Mortification, which being cured by the Surgeon, she lived some Years, and died at last, as her Husband informed Sir David, of a Colick and Convulsion.

An Account of Animal Secretion, the Quantity of the Blood in the Humane Body, and Muscular Motion. By James Keill, M. D.

THIS Learned Physician observes in his Preface, That Diseases being purely Disorders of the Animal Oeconomy, whatsoever can add any new Light to our Knowledge of this, must necessarily clear the Nature of those, establish the Practice of Physick upon a surer Foundation, and enable Physicians to make truer and more certain Judgments in most Cases.

The Animal Body (says he) is now known to be a pure Machine, and many of its Actions and Motions are demonstrated to be the necessary Consequences of its Structure; and since the Animal Body is a pure Machine, and all its Actions, from which Life and Health do follow, are the necessary Consequences of its Oeconomy, all the Symptoms of Diseases must be likewise the necessary Consequences of the Alteration of this Oeconomy: Therefore it demonstratively follows, that the greater our Knowledge of the Animal Oeconomy is, the better the Nature of Diseases must be known. It must indeed be confess'd, says the Doctor, that this Method of improving the Art of Physick is full of Difficulty; but the Nature of Things cannot be alter'd: If it is to be improved, it must be by a Knowledge in the

Animal Oeconomy, there being no other Method, but what does really, and in Effect, depend upon that; and Experience join'd to this Knowledge can only make a Physician: For a Physician ignorant of the Animal Oeconomy, is ignorant of the Structure he undertakes to regulate, and the best and exactest History of Diseases can never suggest to him any Indication of Cure. 'Tis therefore the Animal Oeconomy which alone can enable us, by reasoning upon the Causes, Signs and Symptoms of Diseases, to find out their Natures, and to deduce true and just Indications of Cure. For Instance: Don't all the Symptoms of the Jaundice shew us that the Liver is obstructed? And don't we deduce this Obstruction by the Knowledge of the Animal Oeconomy? And does not this Obstruction indicate Bleeding, Vomiting, Purging, and Deobstruent Medicines, which are used in curing of this Disease.

If the Animal Oeconomy were perfectly understood, and the Histories of Diseases exactly known, the right Method of curing each Disease might be evidently and certainly deduced: Therefore when the History of a Disease is exactly known, if the right Method of curing it cannot be deduced, it must

be because the Animal Oeconomy is not understood.

This Oeconomy is 't self a considerable Part of Natural Philosophy, and our Bodies are strongly influenced by Variety of Diets, and so many Things from without, that indeed the whole Study of Nature seems to be useful to him that would understand it.

This Book contains a few Thoughts about some of the principal Parts of the Animal Oeconomy. It was the Consideration of the Use of the *Vena Porta*, which gave the Doctor the first Hint to think, that the several Humours of the Body were form'd by the Attraction of the Particles of the Blood.

The Doctor, in explaining how the several Fluids of the Animal Body are separated from the Blood, shews, 1. How they are form'd in the Blood before they come to the Place appointed for Secretion: 2. Demonstrates in what Manner they are separated from the Blood by the Glands.

The Blood of Animals, when drawn out of the Body, does naturally divide into two different Parts; the Red, which does in a little Time coagulate; and the *Serum*, which remains fluid. In a Drop of Blood view'd with a Microscope, we see a Number of red Globules swimming in a limpid Fluid, and perceive how the Globules attracting one another unite like Spheres of Quicksilver, which, as they touch, run into one another, and consequently the Blood divides into two Parts. After the Coagulation of the Red, if we examine the *Serum* with a Microscope, we find in it likewise a great Number of Corpuscles of various Figures and Magnitudes swimming in a limpid Fluid. These don't attract and unite with one another, as the former did, till some Part of the Fluid in which they swim has been evaporated by Heat, and then they likewise attract one another, and form a *Coagulum*, as the Globules did.

This therefore is Matter of Fact, that the Blood consists of a simple and limpid Fluid, in which swim Corpuscles of various Figures and Magnitudes, and endued with different Degrees of an attractive Force. Now of such Particles as the Blood consists, must the Fluids be composed which are

drawn from it; and as in the Blood the Particles attract one another and cohere together, so likewise may the Particles of the Fluids which are separated from it.

Most of the Liquors we know are form'd by the Cohesion of Particles of different Figures, Magnitudes, Gravities, and attractive Powers, swimming in an aqueous Fluid, which seems to be the common *Basis* of all. Why are there so many Sorts of Water differing from one another in Properties? Is it not because of the Corpuscles of Salts and Minerals with which the Element is impregnated? What else is Wine but Water impregnated with the Particles of the Grape, and Ale with Particles of Barley? Are not all Spirits the same Fluid saturated with saline or sulphureous Particles? And all Liquors are more or less fluid, according to the greater or small Cohesion of the Particles which swim in this aqueous Fluid; and there is hardly any Fluid without this Cohesion of Particles, as is apparent by the Bubbles which stand upon the Surface of Water, Wine, and even of some Spirits.

But that some of the Fluids which are secreted by the Glands from the Blood, are actually composed by the Cohesion of several Sorts of Particles, is very evident. We know, that in Milk there are three or four several Sorts of Substances, and yet when examined by the Microscope, it appears like Blood to consist of very small Globules swimming in a limpid Fluid. Urine has the same Appearance, and contains perhaps more Principles; and there is no Doubt, but that Tears, Spittle and Sweat, are all compounded Liquors. If some of the Fluids which are secreted by the Glands are not easily resolv'd into their compounding Parts, we can no more conclude from thence that they are not compounded, than we can that the Blood is not, because it does not separate into about 30 different Fluids, of which it is composed, and which are constantly extracted from it by the Glands.

If the Particles which attract one another, are still more powerfully attracted by the Particles of the Fluid in which they swim than by one another, they can never of themselves separate from the Fluid; and this is the Case of all Salts dissolv'd in a large Quantity of Water, and of Urine when it
neither

neither breaks nor settles. But if the Particles which swim in the Fluid are more strongly attracted by one another than by the Fluid by which they swim, then this Fluid must necessarily go into Parts, and the Corpuscles uniting will either sink, swim, or ascend, in the Fluid, according to their specific Gravities, unless there should be so many Interstices within the coagulated Mass as will receive the greatest Part of the Fluid. From hence it is plain, that the red Part of the Blood consists of Particles which attract one another more than they do the watry Fluid in which they swim, and that the other Particles which are in the watry Fluid of the *Serum* are more attracted by it than by one another: But if Part of this watry Fluid be evaporated, by this Means the Particles attracting approaching nearer, the Force of their Attraction is increas'd, and then they unite, and consequently this Force must be much stronger in Particles that are very nigh one another than when they are at a Distance. This Power by which Particles of the Blood attract one another, is the same with that which is the Cause of the Cohesion of the Parts of Matter; and since it will appear, that the whole Animal Oeconomy does likewise depend upon this attractive Power, it seems to be the only Principle from which there can be a satisfactory Solution given of the *Phænomena* produced by the *Minima Naturæ*, as that other attractive Principle, which is of a different Kind from this.

From this Principle, that the Blood consists of Corpuscles of various Figures and Magnitudes, and endued with various Degrees of an attractive Power, and that of such Particles the Fluids secernd by the Glands are composed, the Doctor endeavours to shew, how the Corpuscles that compose the Secretions are form'd in the Blood before they arrive at their secerning Glands; and for this End he lays down the following Propositions or Laws of Attraction, which at present he has Occasion for, the rest being contained in his Brother's Theorems, published in the *Philosophical Transactions*.

Prop. I. *There is a Power in Nature by which each Particle of Matter attracts every*

other Particle, with a Force that increaseth in a greater Proportion than that by which the Squares of the Distance increase, viz. in a reciprocal, triplicate or quadruplicate Proportion to the Distances.

For were the Particles that compose the attracting Body endued with a Power that attracted only with a Force reciprocal to the Squares of the Distances, the Attraction would not be much stronger at the Contact than at some determined Distances from it. The Doctor instances in the Case of Gravity, which arises from a Power of attracting reciprocally, as the Squares of the Distances, Bodies being of the same Weight when they touch the Earth, as they are at 100 Feet Distance. But by all Experiments, this Power is much greater at the Contact, or extremely near it, than at any determined Distance. The Particles of Salt dissolv'd in a large Quantity of Water do not sensibly attract one another, till that Part of the Water has been evaporated; by which Means approaching each other, their attractive Force increases, they run to one another, and uniting, form Crystals, whose Parts have a strong Cohesion: And therefore the Force by which each Particle attracts every other Particle, must increase in a much greater Proportion than that by which the Squares of the Distances decrease.

Prop. II. *The attractive Force is ceteris Paribus proportional to the Solidity of the Particles.*

The attractive Force of a Particle is composed of the Sum of all the Attractions of the Parts of that Particle. Now these Parts are most numerous in the most solid Particles; and therefore *ceteris Paribus* their attractive Force is strongest.

Schol. This Proportion is to be understood of the smallest Particles of Matter, and not of the Corpuscles made up of those Particles: For Corpuscles may be so compounded; that the most solid and compact Particles may make up the lightest Corpuscles, if the Interstices between the Particles be large, so that few of them may be diffused through a great Space. Such a Corpuscle, tho' it consists of Particles that are endued with a strong

strong attractive Power, may yet be superficially lighter than another which consists of Particles not so solid, but closer together; and of such Sort of Corpufcles all Salts are conceived whose Particles of the last Composition are very solid, but that there are great Interstices between those Particles, into which the Water running with a Force, being strongly attracted, dissolves the Texture of the Corpufcles.

Prop. III. *If Particles of Matter attract each other with a Force that is in a reciprocal, triplicate or a greater Proportion of their Distances, the Force by which a Corpufcle is drawn to a Body made up of such attractive Particles, is infinitely greater at the Contact, or extremely near it, than at any determined Distance from it.*

Prop. IV. *If a Body consists of Particles attracting with a Force that is in a reciprocal Proportion to the Cubes of the Distances, or in a greater; and if this Force is not infinitely greater than the Force of Gravity at the Point of Contact, or extremely near it, at any determined Distance from the Point of Contact it must be infinitely less than the Force of Gravity.*

Prop. V. *The Force by which the Particles of Matter attract each other when extremely near the Contact is not infinitely greater than the Force of Gravity.*

Prop. VI. *A large Particle attracts not more strongly than a small one of the same Solidity; but a Diversity of Figures causeth different Degrees of Attraction in Particles that are otherwise the same.*

Prop. VII. *If Particles swimming in a Fluid attract one another more strongly than they do the Particles of the Fluid, the Force by which they come to each other will be that by which their attractive Force exceeds the attracting Force of the Fluid.*

Prop. VIII. *If Particles swimming in a Fluid are more attracted by the Fluid than by one another, with a Force that will be equal to the Difference of their mutual Attraction, and the Attraction of the Fluid.*

Prop. IX. *The Force by which Particles attracting one another cohere, is greater cæteris Paribus where the Contact is greater.*

Prop. X. *If the attracting Corpufcles are elastick, they must necessarily produce an intestine Motion, greater or lesser, according to the Degrees of their Elasticity and attractive Forces.*

Prop. XI. *Particles attracting one another in a Fluid moving either with a swift or slow progressive Motion, attract one another just the same as if the Fluid was at Rest, if all the Particles move equally; but an unequal Velocity of the Particles does mightily disturb their Attractions.*

These are the Laws by which Secretions are first form'd in the Blood, before they are separated by the Glands. The Particles of the Blood returning by the Veins, mutually attract one another, and cohering, form Globules too big for any Secretion; and therefore there was an absolute Necessity that they should be broken and divided in the Lungs by the Force of Respiration; which, because it is commonly thought to be inconsiderable, by reason we are not sensible of it, the Doctor here makes an Estimate of.

'Tis demonstrated by the Writers of Hydrostaticks, That Weights which force out of the same Tube equal Quantities of the same Fluid, are to one another as the Squares of the Times the Fluid is forced out in: But if the Times are equal in which the same Quantity of the Fluid is forced out through unequal Tubes, then the Powers are reciprocally as the Orifices of the Tubes: And therefore Powers which thrust out the same Quantity of a Fluid through unequal Tubes, are to one another in a reciprocal Proportion compounded of the Squares of the Times and Orifices of the Tubes.

In order to know by what Force the Air is thrust out of the Lungs in Expiration, the Doctor says, he took a thin Hog's Bladder, which he could easily blow up with the Breath of one Expiration, and having moisten'd it, that it might neither resist the Air in blowing up, nor the Weights which were laid upon it, he fix'd a small Tube, whose Diameter was one tenth Part of an Inch, to the Neck of the Bladder; then filling the Bladder with Air, he put a Weight of half a Pound four Ounces on the Top of it: And having repeated the Experiment several times, he found that this Weight squeez'd all the Air out of the Bladder thro' the small Tube in the Space of 25 Vibrations of a Pendulum, which vibrated Seconds of a Minute.

By this Experiment, he supposes that 1600 Ounces, equal to 100 Pound, is the Force

Force by which the Air is thrust out of the Lungs every Expiration: But since Action and Reaction are equal, the Pressure of the Air upon the Lungs every Expiration is equal to the Pressure of an hundred Pound Weight. If the Gravity of the Air was always the same, and if the Diameter of the *Trachea Arteria* and the Time of every Expiration were equal in all, this Weight upon the Lungs would always be the same. But since we find by the Barometer, that there is three Inches Difference between the greatest and the least Gravity of the Air, which is one tenth Part of its greatest Gravity, there must be likewise the Difference of ten Pound Weight in its Pressure upon the Lungs at one Time and another; for the *Momenta* of all Bodies moved with the same Velocity are as their Gravities. This is a Difference which such as are Asthmatick must be very sensible of, especially if we consider, that they likewise breath thicker, that is, every Expiration is performed in less Time; if in half the Time, and the same Quantity of Air drawn in, then the Weight of the Air upon the Lungs must be Four hundred Pound, of which one tenth Part is forty Pound; and consequently Asthmatick People, upon the Rise or Fall of the Barometer, feel a Difference of the Air almost equal to half its Pressure in ordinary Breathing. Again, if the *Trachea Arteria* is small, and its Aperture narrow, the Pressure of the Air increases in the same Proportion as if the Times of Expiration were shorter; and therefore a shrill Voice is always reckoned amongst the Prognostick Signs of a Consumption, because that proceeds from the Narrowness of the *Larynx* or *Trachea Arteria*, and consequently increases the Pressure of the Air upon the Lungs; which, upon every Expiration, beats the Vessels so thin, that at last they break, and a Spitting of Blood brings on a Consumption apace.

The Doctor supposes, that no Body doubts whether this Pressure of the Air upon the Lungs be sufficient to break the Globules of the Blood, and to dissolve all the Cohesions they might contract in their Circulation thro' the Arteries and Veins: And when the Blood is thus dissolv'd and thrown out by the Heart into the *Aorta*, 'tis evident, that the Reunion of the Particles requires more

or less Time according to their attractive Powers, even tho' they all moved with the same Velocity, and in the same Direction. But this doth not happen; for a Fluid moves thro' a Cylindrical or Conical Vessel (such as the Arteries are) with a greater Velocity at the Axis than at the Sides. And again, the Blood is thrust into the *Aorta* by the whole Force of the Heart, and Fluids, when they are press'd, press *undequaque*; by which Means the Arteries are dilated, and the Blood moves not only forwards, but likewise presses perpendicularly on the Sides of the Arteries; and as the Sides of the Arteries (being elastick) return, they press the Blood from them every Way, which must produce an intestine Motion, and by the 11th Proposition hinder the Attraction of the Particles, and by this frequent and strong Collision of the Particles of the Blood against the Sides of the great Arteries, the Cohesions of the Particles, if there be any, will be immediately dissolv'd. Again, this intestine Motion must greatly increase, upon the Account that many of the Particles of the Blood are elastick; for by this Resistance of the Sides of the Vessels, they must necessarily hit one against another, and being elastick, reflect from one another, and so increase the intestine Motion of the Blood by the 10th Proposition. Upon this intestine Motion depends the Heat of the Blood, which therefore is every where proportional to the *Impetus* of the Particles against the Sides of the Vessels, supposing the Elasticity of the Particles every where the same. Now the *Impetus* of the Particles against the Sides of the Vessels decreases as the Sum of the Cavities of the Vessels increases; and consequently where the Sum of the Cavities of the Vessels is greatest, there the intestine Motion of the Blood is least, and the attractive Power of the Particles is *ceteris Paribus* greatest.

The Doctor observes, that Steel being an elastick Body, heats the Blood more than any other Mineral, and that the Force of its own Particles in removing Obstructions, as well as those of the Blood, increase; and therefore 'tis a better Deobstruent than some other Minerals of a greater Gravity.

The Particles which unite first after the Blood is thrown out of the Heart into the Great Artery, must be such as have the

strongest attractive Force; such as have the least unite last, and the intermediate ones according to their Natures. The Particles endued with the strongest attractive Powers are by the 2d and 6th Proposition the most solid spherical Corpuscles, and the Quantity of their Contact being the least by the 9th Proposition, the Secretion which they compose must be the most fluid, and such is the Liquor in the *Pericardium*.

The Salts are Corpuscles that are strongly attracted, and have a most close Union with the Fluid of Water; for the Doctor observes, that tho' the Lungs may divide the Particles of Salt from one another, yet still they firmly adhere to the aqueous Humour in which they swim, and therefore they may likewise at first be drawn off; upon which Account the Kidneys have their Situation so near to the Heart. And indeed, they could not have been placed at a greater Distance, and have separated such a Quantity of Urine as now they do, not only upon the Account of the great Quantities of Blood they receive where they are; but likewise, because if they had a more distant Station, other Particles must have united with the Salts and aqueous Particles, (as in their preisd Station some terrestrial Particles do;) and consequently the Urine could not have been distilled such as it is now, or at least but in a small Quantity.

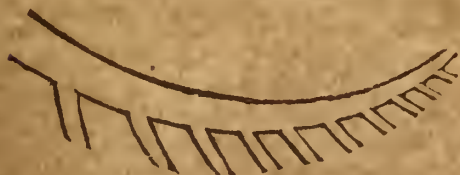
The Corpuscles which are the slowest in uniting must be such as have the weakest attractive Force, which by the 2d and 6th Proposition are such as have the least Solidity, and such as have their Surfaces the most extended; and therefore Corpuscles which have plain Surfaces are longer in uniting than spherical Corpuscles; but when united, they cohere more strongly by the 9th Proposition, and compose the most viscid Fluids; and therefore the most viscid Secretions, such as the Mucilage of the Joints, are separated at the greatest Distance from the Heart. Where the Sum of the Cavities of the Arteries is greatest, the *Impetus* of the Blood against the Side of the Vessels (which is always proportioned to the Velocity of the Blood) is smallest, and consequently where the Particles move almost with an equal Velocity; and therefore the Attractions of the weakest are not disturbed by the 11th Proposition.

Since the Gall which is secreted by the Liver, and the Seed by the Testicles, seem'd to be two considerable Objections against what the Doctor advanced, he says, they are so far from proving any Thing against this Doctrine of Secretions, that they are the greatest Arguments that could possibly be used for the Truth of it. Nothing (says he) does more evidently demonstrate the Intentions of Nature in her Operations, than the various Methods she is sometimes forced to take to bring the same Thing about.

This is eminently remarkable in the Secretion of the Gall, which being to be mix'd with the Chyle as it comes out of the Stomach into the *Duodenum*, would no where be so conveniently secreted from the Blood as where the Liver is placed. Now had all the Branches of the Celiac Artery carried all the Blood to the Liver, from which the Gall is to be separated, 'tis evident, considering the Nearness of the Liver to the Heart, and the intestine Motion of the Blood, that so viscid a Secretion as the Gall is could never have been form'd in the Blood, and consequently could never have been secreted by any Gland in that Place. In this Case, Nature is forced to alter her constant Method of sending the Blood to all the Parts of the Body by the Arteries. Here she forms a Vein which is no Branch of the *Vena Cava*, as all the other are, and by it she sends the Blood from the Branches of the Mesenterick and Celiac Artery, after it has pass'd through all the Intestines, Stomach, Spleen, Caul and *Pancreas*, to the Liver. By this extraordinary Continuance, the Blood is brought a great Way about before it arrives at the Liver, and its Celerity is extremely diminished, that all the Corpuscles which are to form the Gall may have sufficient Time to attract one another, and unite before they come to the secreting Vessel. Thus (says the Doctor) we have found out the Use of the *Porta*, which, notwithstanding it makes so considerable a Figure in the Animal Body, yet perhaps no Part was ever less minded, or had its Use less understood, by the Writers upon the Animal Oeconomy.

But that this is most certainly the Use of the *Porta*, will more evidently appear, if we consider what Nature still does further in Prosecution of the same Design. The Cavities

vities of all the Arteries increase as they divide. The Sum of the Branches which rise immediately from the *Aorta* is to the same as 102740 to 100000. But as if this Proportion was too little to effect the Design of Nature before the Blood arrives at the Liver, the Branches which immediately spring from the Trunk of the Mesenterick Artery increase in a much greater Proportion. The Figure of this Artery, as it lies in the Middle of the Mesentery, is represented by the Doctor after this Manner.



And in that Body, from which he took the following Proportions, he found 21 Branches to spring immediately from its Trunk. He adds, that in such Parts of which the Trunk of the Mesenterick Artery is 15129, the

First Branch is,	2136
Second,	1936
Third,	2136
Fourth,	2104
Fifth,	4489
Sixth,	1936
Seventh,	2601
Eighth,	3136
Ninth,	1681
Tenth,	3025
Eleventh,	625
Twelfth,	1369
Thirteenth,	1024
Fourteenth,	1849
Fifteenth,	1936
Sixteenth,	529
Seventeenth,	729
Eighteenth,	1156
Nineteenth,	1024
Twentieth,	1156
Twenty first,	841

The Sum of all, 37418

By these Proportions he makes it appear, that the Sum of the first Branch is much more than double to the Trunk of the Mesenterick Artery; and therefore the Velocity of the Blood in them is much less than half what it is in the Trunk. But because the other Branches do not exceed one another so much, he therefore supposes, that the Branches are only double to their respective Trunks, and that there are only six Series of Divisions between the Trunk and the Evanescent Artery; whereas most of the Branches have so many Series whilst they run upon the Mesentery, and many more upon the Intestines; so that what he perhaps exceeded in reckoning the Branches double to their Trunks, is more than made Amends for in supposing so few Divisions. Now from this easy Supposition, the Velocity of the Blood in the several Series will decrease in the same Proportion as the Increase of 2, 4, 8, 16, 32, 64. And therefore the Doctor concludes, that the Velocity of the Blood in the Evanescent Artery will be 64 times less than it is in the Trunk of the Mesenterick.

As the Trunk of the Mesenterick Artery bears a lesser Proportion to its Branches than the *Aorta* does to its Branches, so the Branches of the Mesenterick Artery are less in Proportion to their Conjugate Veins than the *Aorta* is to the *Vena Cava*. The Descending Trunk of the *Aorta* below the Emulgents is to the *Vena Cava* at the same Place as 324 to 441. But a Branch of the Mesenterick Artery is to its corresponding Branch of the *Porta* as 9 to 25, and therefore the Blood in the Branches of the *Porta* moves above 177 times slower than it does in the Trunk of the Mesenterick Artery, and that only upon the Account of the Increase of the Diameters of the Vessels; so necessary was it to abate the rapid intestine Motion of the Blood, which might hinder the Coalescence of the Particles for the Formation of the Bile. The Blood is indeed no where without an intestine Motion; but where the Sum of the Cavities of the Blood-Vessels is greatest, there the intestine Motion being most languid, the Particles which hit against one another don't resist, but unite together; and a very languid intestine Motion, by bringing Particles nearer to one another,

which otherwise would not have come together, conduces to increase the Combination of Particles.

He proceeds next to consider what Care Nature has taken of the Blood which is convey'd by the Cæliack Artery to the Liver; for it seems it was necessary to send a larger Quantity of Blood to the Liver than could be dispos'd of thro' the Intestines. Part of the Blood of the Cæliack Artery is bestow'd upon the Stomach and Caul, and its Velocity diminish'd (as has been shewn) in the Intestines; but still all the Blood which these Parts could receive was not sufficient for the Liver, and there being no more Room for the Division and Expatiating of the Vessels through such a large Space as the Mesentery and a long Tract of Guts, Nature, in order to abate the Velocity of the rest of the Blood (to which the intestine Motion is proportional) empties the Blood entirely out of the Vessels into a large spongy Bowel, or rather Cistern for that Purpose. Our Author does not know the Dimensions of the Splenick Artery; but the Circumference of the Cæliack being half an Inch, or 5, and its Square 25, he thinks that the Square of the Splenick, which is a Branch of it, cannot be above 18. He adds, that the Dimensions of the Spleen are 6 Inches in Length, 3 or 4 in Breadth, and 2 in Thickness; and supposing it to be a Cylinder of 2 Inches Diameter, and the Square of its Circumference 36, he concludes, that the Blood moves 200 times slower in the Spleen than in the Beginning of the Splenick Artery, and is longer before it gets to the Liver than that which passes thro' all the Intestines.

All this makes it evident to a Demonstration, that the Intent of Nature was to diminish the Velocity of the Blood, that such a slow Motion was absolutely necessary for the securing the Bile in the Liver, and that if the Humours which are separated by the Glands are at all Times and Places the same in the Blood, and not found after the Manner demonstrated, there was no Need for so considerably diminishing the Velocity of the Blood, since, let this move fast or slow, they would always be the same, and in an equal Aptitude to be discern'd.

Then he shews, that the Particles which

compose the Bile bear a very small Proportion to the rest of the Blood, from the great Quantity of Blood carried to the Liver, and the small Quantity of Bile separated by it. He instances in a large Dog, whose *Ductus Cholidochus* was near as big as a Man's, in which he could never gather above 2 Drains in an Hour: But he says, there's thrown into the *Aorta* every Hour about 4000 Ounces of Blood; and that the Mesenterick and Cæliack Arteries are to the rest as 1 to 8, so that 500 Ounces of Blood are carried every Hour to the Liver; and since only 2 Drains of Bile are separated from it, the Bile must be to the Blood at least as 1 is to 2000. 'Tis therefore this small Proportion of the Bile to the Blood made it so necessary to allow so much Time for the Attraction of the Particles which form the Bile. Besides, the Blood passing through so many different Parts before it comes to the Liver, parts with most of its *Lympha*, by which Means the Particles that compose the Bile approaching nearer one another, are by mutual Attraction sooner united. The Doctor adds, that both these Considerations highly confirm the Truth of this Theory of *Secretion*; for the Diminution of the Velocity of the Blood, and the Subtraction of the *Lympha*, can agree in no other End than the uniting the Particles of the Bile.

As to the Objection about the Formation of the Seed, the Doctor says it further manifests the Truth of this Doctrine of Secretions, and that Nature pursues the same Intentions, though in a different Manner, the Structure of the Parts not allowing either of the former Contrivances.

The Blood (he says) is carried to the Testicles by the Spermatick Arteries, which, contrary to the constant Method of Nature in framing the other Arteries, are smallest where they spring from the Trunk of the Great Artery, and immediately dilate to a considerable Bigness; which evidently shews, there could be no other Design in it but to retard the Velocity of the Blood: For it cannot be supposed, that the only Intention was that a small Quantity of Blood might go to the Testicles, because then there had been no Occasion for giving the Artery a different Figure from all others; that nar-

row Orifice would have been sufficient of it self for that Purpose, which the Wideneſs of the Artery immediately afterwards does neither hinder nor further. The Orifices of the Spermatick Arteries were ſo ſmall, that the Doctor ſays he could not meaſure them when he did the other Arteries, and yet as ſoon as ever they are paſſ'd the *Aorta*, they dilate as big, if not bigger, than one of the Lumbals, which is 434, 2. Now ſuppoſing their Orifices to be each 17, 3. then the Blood will move 25 times ſlower where the Artery dilates than it does at the Orifice. Again, we conſtantly find that all the Parts of the Body are ſupplied with Blood by ſmall Arteries from the neareſt Trunks. If this Method had been obſerv'd in ſending the Blood to the Teſticles, they had received their Arteries from the Iliacks, and they had ran but a little Way before they had come to the End of their Journey: But inſtead of this, two ſmall Arteries are made to ariſe from the *Aorta* a little below the Emulgents, and to march above a Foot before they come to the Teſticles. Now granting that the Velocity of the Blood in the Spermatick Artery is 25 times ſlower than it is at its Orifice, i. e. in the *Aorta*, and that the Velocity of the Blood in the Iliacks can be but very little leſs than it is in the *Aorta* where the Spermaticks ariſe, the Blood muſt move 25 times ſlower to the Teſticles than if it had gone after the ordinary Manner from the Iliacks; and becauſe the Space it runs thus ſlowly is at leaſt 6 times longer than if it had gone from the Iliacks, therefore it muſt be 150 times longer in going to the Teſticles than if it had gone according to the common Courſe of Nature; ſo that the inſtantine Motion of the Blood is not allay'd, but ſufficient Time is afterwards allow'd the Particles, which are to compoſe the Seed, to attract and coaleſce before they arrive at the Teſticles.

If it be objected, That the *Mucus* of the Noſe, and the Wax of the Ear, are ſeparated where the Blood is not ſo languid as their Viſcidities ſeems to require; it is answer'd, That they are Fluids which fall into open Paſſages, where the Air having free Admiſſion, carries off Part of their aqueous Fluid, and the Remainder becomes thick, as the *Serum* of the Blood does when heated. Be-

ſides, 'tis to be obſerv'd, that though the Cohesion of the Particles depends upon their Figures, yet the Force by which they attract one another is likewiſe in Proportion to their Solidities; ſo that tho' Particles of equal Magnitudes and ſimilar Figures may cohere equally ſtrongly, yet the moſt ſolid will ſooner unite. Hence it is, that of two Fluids equally viſcid, the heaviereſt may be ſeparated in Glands nearer to the Heart than the other; and that two Fluids of different Viſcidities may be ſeparated at the ſame Vicinity to the Heart, if the Quantity of the Contacts of the Particles be ſuch as will make Amends for their Want of Solidity.

Moſt, if not all, the Secretions contain a greater or leſſer Proportion of the aqueous Fluid, which makes them more or leſs viſcid; yet that which contains the greateſt Quantity may conſiſt of Particles endued with a very ſmall and ſlow attractive Force, and conſequently ſuch a Fluid cannot be ſeparated by any Gland ſo near the Heart, as that which has a leſs Proportion of the aqueous Fluid, and which conſiſts of Particles endued with a ſtronger attractive Force; and this laſt Fluid may be much more viſcid than the other whoſe Particles are more dilated by the watry Fluid.

But that the different Viſcidities of the Secretions do not depend only on the greater or leſſer Proportion of the aqueous Fluid, is evident from the foregoing Propoſitions, unleſs any one can ſuppoſe that the Blood conſiſts only of one Sort of Particles; which Suppoſition, beſides that it contradicts Matter of Fact, can never account for the Secretion of ſo many different Fluids: And that the Diversity of the Attraction in the Particles, is the Reaſon why various Velocities of the Blood, and Diſtances from the Heart, are required for ſecerning of different Liquors, is moſt evident from what has been ſaid concerning the Ule and the Seed. If only a greater or leſſer Proportion of the aqueous Fluid had been requiſite for ſeparating of different Sorts of Fluids, that might have been done any where, as the Doctor ſhews hereafter, and Nature had not been put to ſo many Shifts and Contrivances as we have already ſeen.

As ſome Fluids are only to be ſeparated in certain Velocities of the Blood, and at cer-
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tain Distances from the Heart, so there may be others that may be separated any where, and in any Velocity of the Blood. These are such as consist of Particles always in an equal Aptitude to be fecern'd; and tho' some of them may contain several Sorts of Particles, yet the Nature of these Fluids does not depend upon the Attraction and Cohesion of their Particles. Such Sort of Secretion is the *Lympha*, which is a watry Fluid, fecern'd in all Parts of the Body, for making the Chyle more liquid. If it be said, that since the *Lympha* might have been separated any where, and that it serves only to dilute the Chyle, that there ought to have been a particular Gland somewhere for it in the *Abdomen*, as being the more proper Place: He answers, that a large Quantity of *Lympha* was necessary for diluting the Chyle, as appears by the numerous Lymphæducts which discharge themselves into the *Receptaculum Chyli*, *Ductus Thoracicus*, and *Subclavian Veins*; and if such a Quantity had been separated by a Gland or Glands in the *Abdomen* appropriated to that Use, they must have had very large and considerable Arteries. The Liver has one 8th Part, and the Kidneys near one 8th more of the whole Blood which passes through the *Aorta*; and if the Lymphatick Glands had had one 8th Part more, (which is the least they could have had) these three Parts would have had near one half of the Blood, and the other half must have serv'd all the rest of the Body, which would have been a very unequal Distribution of the Blood. Besides, Nature is always very simple and frugal in her Operations; she never is at any unnecessary Trouble: And the Doctor proposes to shew in the Second Part of this Treatise, how the *Lympha* may be drawn off by Glands appointed to separate other Fluids; so that for this Operation she makes no Part, and is at no Expence of Blood, whereas she must have been at a very great one, if so much *Lympha* had been drawn off by appropriated Glands.

The Doctor supposes the Animal Spirits to be another Fluid of this Kind. He is positive that they consist of by far the smallest Particles in the Blood, because of the Minuteness of their seeming Glands; and

therefore they not being form'd by the Cohesion of other Particles, might have been separated any where. Yet the Animal Economy receives a great Advantage by the distant Station of the Brain from the Heart; for if it had been placed nearer, and receiv'd the Blood still divided into its smallest Particles by the Force of the Air in the Lungs, such Particles might have enter'd the Glands, and afterwards cohering to one another, might have obstructed such extremely narrow Channels. Now the Brain being placed at such a Distance, the Particles, that by their attractive Power form Corpuscles, will have sufficient Time to coalesce, and their Magnitudes will hinder their entring into the Glands; for if it should happen that these Particles should enter the Glands, and there unite together, they would then obstruct the Passage to the Nerves, and produce *Apoplexies*, *Palsies*, *Coma's*, &c.

The Particles of which the Animal Spirits consist being of such extreme Fineness, their Quantity can bear but a small Proportion to the other Fluids in the Blood; and consequently there was a Necessity of a prodigious Number of Glands to separate them from the Blood, and this is the Reason of the great Bulk of the Brain.

The Operations of Nature are always the most easy and simple; from whence he infers, how much more easy it is to have the several Secretions formed after the Manner which has been demonstrated, than to suppose as many different Sorts of Particles in the Blood as there are Fluids separated from it; for 'tis difficult to determine how many different Sorts of Particles are in the Blood. The Doctor thinks, that Physick is in nothing so defective as in the Knowledge of the Nature of the Blood; but that if the same Pains had been bestow'd upon it in a Mechanical Way, that have been vainly spent in Search of its Principles by Chymists, we had long e'er now had a more perfect Knowledge of its Nature than ever we can have by Chymistry; which can only shew how, by Art, its Parts may be alter'd, not what Parts it contains.

He says, a few different Sorts of Particles variously combin'd will produce great Variety of Fluids: Some may have only one Sort,

Sort, some two, some three, or more, and perhaps the aqueous Fluid is the common Basis of all the Secretions.

Our Author thinks what he has hitherto advanced sufficient to shew how Medicines operate which increase or diminish the Quantity of any Secretion. There is no Need of giving Medicines Commissions for searching and opening the Stitches of particular Glands; nor have they a general Power to attenuate and dissolve all the Cohesions of the Blood; for then we might still ask, Why their Operations appear only on one Sort of Glands? Why does Jallap carry the dissolv'd Humours through the Glands of the Intestines rather than any other? Why does Mercury salivate, or Nitre force Urine? All Theories of Secretions have laboured at this Point, which naturally discloses it self in this.

The several Humours being form'd by the different Cohesions of the Particles of the Blood, the Quantity of Humour seern'd by any Gland, must be in a Proportion compounded of the Proportion that the Number of the Particles, cohering in such a Manner as is proper to constitute the Humour which passes through the Gland, bears to the Mass of Blood, and of the Proportion of the Quantity of the Blood that arrives at the Gland: And hence it follows, that where there is a determin'd Quantity of a certain Humour to be separated, the Number of Particles that are proper to compose the seern'd Liquor must be reciprocally proportional to the Quantity of the Blood that arriveth at the Gland; and therefore if the Quantity of the Secretion is to be increas'd, the Number of the Particles is to be increas'd; if the Secretion is to be lessen'd, the Number of the Particles that are proper for such a Secretion is to be lessen'd in the same Proportion. Medicines therefore which can alter the Cohesions and Combinations of the Particles, can either increase or diminish the Quantity of any Secretion. Thus for Example, says the Doctor, suppose the Humour which passeth thro' the Glands of the Intestines to be compos'd of three or four several Sorts of Particles, that Medicine which will easily cohere to these Particles, and cohering increase their mutual Attractions, so as they unite in greater Numbers at or before they arrive at the Intestines, than

they would have done if the Medicine had not been given, must necessarily increase the Quantity of Humour which passeth through the Glands of the Intestines, if the Quantity of Blood which arrives at the Glands is not diminish'd in the same Proportion as the Number of the Particles is increas'd. Thus Diureticks, Sudorificks, and Medicines which promote all other Secretions, operate after the same Manner.

If Medicines which increase the Quantity of any Secretion, operate by uniting to and augmenting the attractive Force of the Particles which compose the Humours to be seern'd, May not the Particles of some Humours sooner, more easily and strongly, unite to the Particles of some Sort of Medicines than to another Sort? And consequently may not different Humours require different purgative Medicines to carry them off thro' the Glands of the Intestines? And does not this re-establish the Doctrine of Specifick Purges, confirm'd to the Ancients by Experience and Observation, but rejected by the Moderns thro' a false Philolophy?

After this, the Doctor shews how necessary the Knowledge of Secretion is for understanding the Nature of Diseases. The Animal Body, says he, is nothing but a Machine, whose Actions and Motions are all performed by Fluids seern'd from the Blood, and Secretion is the Spring of all the Animal Functions. By its Means the Heart beats, the Blood circulates, the Limbs are moved, and the Aliments concocted and digested; and in a Word, the whole Animal Oeconomy and Life depend upon it, the Blood it self seeming to have little other Use, besides the recruiting and renewing the seern'd Liquors. I say therefore, since Life and Health depend upon the Secretions, so likewise must all Diseases which are said to be universally in the Blood, and many of those which affect particular Parts. If the Quantity and Quality of all the Secretions are such as are proper and useful for the several Purposes for which by Nature they are intended, How is it possible but that the whole Animal Oeconomy must be in right Order, and that Body in a good State of Health? Unless we could suppose an Error in the first Contrivance of the Body, a Thought which no Man in his Senses could be guilty of.

But

But if the Quantity of any Secretion exceeds its due Bounds, what Disorders it makes is evident from a *Diarrhœa*, *Diabetes*, *Epiphora*, *Sweatings*, &c. If the Quantity of any Secretion falls short of what it ought to be, the Effects are of no less pernicious Consequence, as appears from a Suppression of Urine in the Kidney, from the Jaundice, and a Stoppage of Perspiration. And that the Quality of the Secretions alter'd do likewise create great Disorders, is obvious from the Pains of the Colick, of a *Diarrhœa*, and *Dysentery*, from the Sharpness of Urine, which sometimes produces Ulcers in the Bladder and Kidneys; and even the Spittle is known to corrode the Mouth. The Doctor says, he chose to give most Instances of such Secretions as are properly Evacuations, because their Effects are apparent to every one. But if the Alteration of those (says he) is of such ill Consequences, What Effects must an undue Quantity, or the vitiated Quality, of these which are retain'd in the Body, and employ'd about the necessary Functions of Life, produce? The Disorders they create are not so evidently the Effects of their ill State, though by a just Reasoning we may sometimes deduce them; and therefore a right Notion of Secretion must be of the greatest Use and Importance for the understanding of most Diseases.

The Doctor instances in a *Diabetes*, whose preceding Symptoms (he says) are little wandering Pains, and frequent Twitchings of the Tendons, follow'd by a profuse Evacuation of a clammy sweetish Urine, which is constantly attended with a Thirst, quick Pulse, Faintness, and Loss of Strength; all which increase and diminish in Proportion to the Flux of Urine. He shews, that the evident Cause of this Distemper is an habitual Drinking of strong Liquors, which the more spirituous they are, the sooner and the more violently they bring it; yet sometimes it proceeds from a latent internal Cause: But the Nature of it is always best known, by considering the Effects which the evident Causes produce in the Body.

By an habitual Drinking of strong Liquors, it comes to pass that the *Serum* of the Blood contains a large Proportion of a spirituous Fluid. Now the Salts of the Urine or Blood (says the Doctor) will not

dissolve in so vinous a Spirit, *i. e.* the Particles of which the Salts consist are more strongly attracted by one another than by such a Fluid; and therefore the Quantity of Salts in the Blood will be daily increas'd, and circulating through the Capillary Vessels, must irritate the fine Fibres, and cause little Pains and Twitchings all over the Body. But when the *Serum* is full of these Salts, the Distance between them and the Globules of the Blood will be less, and consequently they will attract those Globules more strongly than the Globules attract one another, and the Globules will be dissolv'd through the *Serum*, as is experienc'd by putting urinous Salts and Spirits in the red Part of the Blood when drawn in a Cup. When 'tis thus dissolv'd and united to the *Serum*, 'tis carried off with the *Serum* through the Glands of the Kidneys, and being united to the Salts, will alter their Figures and Properties, and give them a sweet Taste.

Where he treats about the Quantity of Blood in a Humane Body, he shews, that all quick Evacuations of the Vessels must diminish the Quantity of Fluid separated in the Glands; so that the greater Quantity of Urine is voided in a small Time, the less *Saliva* and Animal Spirits will be secern'd by their respective Glands, and consequently Thirst, Faintness, and Loss of Strength, will increase in Proportion to the Quantity of Urine excreted.

From hence he thinks it is evident, that the Indications of Cure are to dissolve the Cohesions of the Salts with the Blood, and to carry them off by Urine; for which End he recommends the Drinking of large Quantities of Waters, and those especially which have a Tincture of Lime, because that strongly attracts urinous Salts.

He says, this Theory furnishes us with a plain Account of the Thickness of the Blood in Rheumatisms; because this Disease arising generally from a Cold, the Orifices of all the Cuticular Glands are extremely contracted, so that scarce any Fluid but the aqueous can pass them; and therefore the other Particles, by the Diminution of the aqueous Fluid being brought nearer to one another, will attract and cohere more strongly, especially in the Extremities, where the Motion of all the Particles is near equal by
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the 11th Proposition. The Doctor thinks this sufficiently proves the Necessity of diluting the Blood in the Cure of Rheumatism, and that this equal Celerity of the Blood in the Extremities is also the Reason why the Concretions of the Gout are form'd there, unless by frequent Debauches, or a Decay of Nature, the Motion of the Blood becomes so languid, that these Particles easily attract one another in the Blood-Vessels of the Bowels; whereas the Motion of the Blood is very slow, and then such Remedies as warm and increase the intestine Motion of the Blood, and thereby disturb the Attraction of the Gouty Particles, relieve the Bowels, and send the peccant Matter to the Extremities. To this Attraction of the Particles in the Urine, the Doctor ascribes the Formation of Gravel and Stone in the Kidneys and Bladder; and says, that the *Nucleus* of the Stone in the Bladder being almost equally surrounded every where with the Fluid of Urine, its Attractions are almost every where equal, and therefore the Stone consists of so many parallel Shells. From hence the Doctor thinks it evident to a Demonstration, that liberal Drinking must prevent the Growth of both; because the attractive Particles are thereby removed at too great a Distance to attract one another, provided the Drink be not too full of Particles that easily and strongly attract one another.

This Author doubts not but the Operations of all Sorts of Medicines may be explained by this Principle of Attraction. For Example, says he, Medicines which thicken the Blood are such as consist of very small Particles, and are endow'd with a strong attractive Force, by which easily cohering to the Globules of the Blood, they increase their Attraction to one another, and so coagulate, or at least condense, the Blood. But if a Medicine consist of such Corpuscles as will easily unite with the aqueous Particles, and increase their Attraction, so that they attract the Globules of the Blood with a greater Force than the Globules attract one another, then will the Globules recede from one another, be diffused through the *Serum*, and the *Coagulum* be dissolv'd. The Doctor is perswaded that a *Gonorrhœa* is produced by a very active Salt, which

being strongly attracted by the Humour in the Glands, and uniting to it, forms a very *virulent Pus*, which corrodes the Vessels, and produces Ulcers; but Mercury mix'd with the Blood attracts the acid Salts of the Pox, and uniting to them, carries them off either by Stool, Spittle, &c. This Power by which Mercury attracts acid and sharp Salts, is the Reason why Cinnabar is so good a Medicine in fix'd and vagrant Pains, as in a Rheumatism; for the Urine of Rheumatick Persons is found upon Examination not to contain its due Quantity of Salts, which therefore being retained in the Blood, turn acid, and produce Pains.

The Doctor proceeds next to give an Account of the Manner how the Fluids, after they are form'd in the Blood, are separated from it by the Glands.

This (says he) depends entirely upon the Figure and Structure of the Glands, which must be first determin'd, and then there will be no Occasion to refute the Doctrine of Ferments, nor the *Hypothesis* of Tubes differing as to the Figures of their Orifices, both which have been several times demonstrated to be false.

Malpighius, *Bellini* and *Nuck*, the greatest Anatomists of this Age, have discover'd that the Glands are nothing but Convolutions of small Arteries; and the Nature of Fluids, whose Pressure is always perpendicular to the Sides of the Vessel, and equal at equal Heights of the Fluid, shews, that all the Vessels of the Body in which the Liquors are continually moving, can have no other than a Cylindrical or Conical Form. If therefore the Sides of the Vessels are soft, and equally yielding every where, they must, by the Pressure of the Fluid contained in them, be equally every where distended; and consequently the Section of such a Vessel perpendicular to its Axis must be a Circle; and therefore the Vessel must be either a concave Cone or Cylinder, or least such a Figure whose transverse Section is a Circle.

Therefore the circular Orifices of the Glands can only differ in Magnitude, and all Sorts of Particles of a lesser Diameter than that of the Orifice of the Gland may enter it; so that without some further Contrivance, that Fluid which contains the biggest Particles must likewise consist of all

the Particles of all the other Secretions: Neither could any Fluid thicker than the Blood be separated from it, because of the great Proportion of the aqueous Fluid, whose Particles being vastly smaller than any other, and invisible to the best Microscopes, must enter all the Glands, and be mix'd with the secret'd Fluid.

The Doctor concludes this Head with a Demonstration how this Inconveniency may be prevented, and how the Particles of any Size may either be separated by themselves, or with any assigned Proportion of the aqueous Fluid, or of other lesser Particles. But we refer the Curious for this to his Book.

Next he gives an Account of the Quantity of Blood in the Humane Body.

Physicians and Anatomists have generally determined the Quantity of Blood in the Humane Body to be between 15 and 25 Pound Weight; but upon what Grounds the Doctor says he knows not, and that all he can find, is the large Quantities of Blood voided by Persons dying of violent Hæmorrhagies, from whence some have ascribed a greater, and others a smaller, Quantity of Blood to the Body. Dr. *Moulin* has allotted a smaller Quantity than any, and determined it thus. He says, that in a Sheep which alive weigh'd 118 Pound, he found by bleeding it to Death there was only 5 Pound 1 qr. of Blood, which is less than a two and twentieth Part of the Sheep's Weight; and that in a Lamb weighing 30 Pound and a half when living, there was but one Pound and a half of Blood, or about a twentieth Part. Now if we suppose that a Man's Blood bears the same Proportion to his Weight as there was betwixt the Blood and Weight of the Lamb, the Doctor says, it will follow that the Quantity of Circular Blood in a Man weighing 160 Pound, will not exceed 8 Pound. But he observes that both these Estimations are made from the Quantity of Blood voided at an open Vessel, and founded upon a Supposition that almost all the Blood in the Body runs out at the Wound, which he proves to be false thus: Suppose the right external Iliac Artery cut asunder, so as that the Blood may freely flow out of the Wound, how can the Blood in the right Leg below the Wound

be emptied? 'Tis cut off from the rest of the Blood above, which should drive it forwards, and it can have but little Assistance from collateral Branches, because they themselves can receive but a very small Quantity of Blood, which runs all to the Wound, where it finds the least Resistance. The Arteries in the Leg can beat no longer, because the Pulse depends upon the Quantity of Blood thrown into them every *Systole* of the Heart, which in this Case is nothing, and these being the only regular Causes of the Motion of the Blood, it must stagnate in the Crural Vessels. Perhaps the great Arteries will once contract, and have some small Vibrations afterwards, by which they will thrust the Blood into the Capillary Vessels, and their convulsive Motions will squeeze the Blood forwards in the Veins; but when an Animal falls into Convulsions by Bleeding, it can bleed but little afterwards when the Motion of the Heart ceases. Besides, neither all Animals, nor all Parts of an Animal, are convuls'd upon bleeding to Death: And though the great Arteries may contract, yet this Contraction must be very languid in the small Arteries, which being innumerable, the greatest Part of the Blood will be lodg'd in them, as well as in the Fibres of the Muscles, which, though naturally white, appear then of a red Colour. Again, though the right and left Iliac Arteries do in the natural State receive an equal Quantity of Blood, yet when a Wound is made in the right, through which the Blood has an easy Passage, this must receive by far the greatest Part of the Blood which comes down the *Aorta*; and consequently the Circulation of the Blood must be very slow in the left Leg, and no more can run from it, than what is thrust out merely by the Motion of the Body, or what flows naturally in the strait and large Vessels, as Fluids will do to come to an *Equilibrium*. For the same Reason the Ascending Trunk or Branches of the *Aorta* can receive but a small Quantity of Blood, and therefore the Pulse in the Arteries of the Brain must be very languid, or none at all; upon which Account the Motion of the Spirits must cease, and consequently that of the Heart. When the *Aorta* begins to be empty, the Blood having little or no Resistance, flows easily into the empty Vessel,

Vessel, and a very small Quantity of it will enter the Orifices of the Coronary Arteries of the Heart, the Valves covering them, and consequently the Motion of the Heart must cease for Want of Blood.

'Tis for the two last Reasons (says the Doctor) that the larger the Vessels are that are wounded, the sooner the Animal dies; and if the *Aorta* it self was cut asunder, there would be a smaller Effusion of Blood from it than from a smaller Artery: For since the Blood in the *Aorta* thrusts forward that in the Veins, and makes it pass from the *Vena Cava* into the right Auricle of the Heart; 'tis plain, that when the Blood in the *Aorta* is intercepted, 'twill be no longer driven through the Veins, but stagnate in them, no more of it coming to the Heart than what flows into it from the Fulness of the Veins; and consequently since the Heart throws but a small Quantity of it into the *Aorta*, the Circulation will be quickly stopped both in the Ascending and Descending Trunks, and there will be no greater Effusion of Blood than what can be contained in the great Artery, which holds but little. Wheresoever the Wound is, the Animal will live so long as the great Artery keeps full; but whenever that begins to empty, the Blood in all its Branches must stop, and consequently the Animal must die.

The Vessels of the Animal Body may be gradually dilated or contracted, and as they cannot suffer any violent and sudden Stretching without breaking, so neither can they immediately contract upon any sudden Evacuation; and therefore when any great Artery is wounded, the Animal dies after a few Pulsations of the Heart, the said Artery being immediately emptied: But when a small Artery at a great Distance from the Heart continues bleeding slowly, all the Vessels throughout the whole Body gradually contract; so that after many Pounds are evacuated, they may be as full as they were at first, and consequently the Animal not so much as faint, the Vessels in the Brain being still kept full, and the Spirits driven forwards in the Nerves; nor can the Animal die till such Time as the Vessels contract no more. For this Reason, says the Doctor, we have no Observations which give Account of such large Effusions of Blood at

Wounds of the great Arteries, as we have from the small Vessels of the Nose, and from the *Hæmorrhoides*; and therefore Dr. *Moulin's* Determination of the Quantity of the whole Mass of Blood, which is calculated from the Quantity voided at the Carotide and Jugular Vessels, is much less than what others from the Observation of *Hæmorrhages* of small Vessels have determined it to be.

He observes, that this contractive Power of the Vessels is not equal in all Bodies; for in some 'tis greatly diminished by the Viscidity of the Blood, and the Obstruction in the Fibres and Capillary Vessels; and therefore some Men may die of a much less Effusion of Blood than others, who perhaps may have a less Quantity of Blood. For the same Reason some Persons faint upon opening a Vein of the Arm. If this elastick Power of the Vessels is strong and great, then as the Blood is let out, the Arteries of the *Pia Mater* contract, and are kept full as well as the Coronary Vessels of the Heart, and consequently there is neither Blood nor Spirits wanting for performing the Motion of the Heart: But 'tis otherwise where this elastick Tone of the Vessels is wanting, viz. to such as have a soft and loose Flesh, a lax and cachectick Habit of Body; and therefore when they require Bleeding, 'tis convenient to stop the blood at small intervals, to give the Vessels Time to contract before the full Quantity design'd be drawn off, and if they are ready to faint, the throwing cold Water in the Face, to cause a sudden Contraction, and the putting them in an Horizontal Posture, that the Vessels of the Brain may fill, and the Blood have an easier Reflux from all the Parts, prevents the Fit. Thus for Want of the same Energy of the Vessels, some faint upon any sudden Evacuation by Urine, Stool, or otherwise. This appears further, because such as faint upon Bleeding at the Arm, do not faint upon Cupping, though the same or more Blood be drawn off that Way, and from the Fainting of Persons tapped for an *Ascites*, if too much Water is drawn off at once. Yet it can't be suppos'd that the Spirits which are in the extravasated *Lympha* have any immediate Influence upon the Nerves and Heart, or that their Substraction should presently

drain the Nerves of Spirits, or that the Spirits are so quickly spent as to suffer because of the Want of a Supply from an extravasated Fluid; but in an *Astiter*, the Descending Trunk of the *Aorta*, and all its Branches, being considerably compress'd, the Blood must necessarily dilate the Ascending Branches beyond their natural Bigness; but when the Waters are let out to any considerable Quantity at once, the Blood has a freer Passage into the Descending Trunk, the Sum of the Cavities of both Arteries is augmented, and the Quantity of the Blood thrown out every *Systole* not being greater, the Arteries cannot be so much dilated, and consequently the Pulse becomes small, the Spirits are but slowly propell'd through the Nerves, the Blood flows but in a small Quantity into the Coronary Vessels of the Heart, and a *Syncope* must ensue, till the Vessels can recover their Tone, and the Blood in all the Arteries comes to an *Aquil. brisum*; for which Reason the Doctor recommends the Use of some Cordial, to rarify the Blood, and rouse the languid Motion of the Spirits.

The Doctor proves, that the Quantity which the Compression of the Descending Artery must throw into the Ascending Branches is considerable, and affects the whole Machine, from the Flushing and Head-ach which some feel after a plentiful Meal, when the Stomach and Guts being loaded, press upon the Descending Trunk, and contract its Cavity, which are the Causes why a greater Quantity of Blood passes into the Ascending Trunks; but if the Cavity of the Descending Trunk should be dilated, there will be a less Quantity of Blood thrown into the Ascending Trunk, and consequently the Effects on the Animal Body must be at least as sensible.

This contractive Power of the Vessels ought to be duly consider'd before the least Quantity of Blood be drawn in most acute, as well as chronick, Diseases; for otherwise it may be lost to a great Degree in a few Hours. He condemns the drawing off a large Quantity at a Time, and says, it may be done more safely, and to as good Purpose, at small Intervals. 'Tis evident from the Theory of Secretions, that both the Quantity and Quality of the Secretions may be alter'd by Blood-letting; so that when the Blood is

upon a Ferment, and generates new Cohesions of whole Nature we are ignorant, 'tis a Risk which ought not to be run without evident and cogent Reasons.

The Doctor proves, that the Quantity of Blood in the Humane Body must be much greater than the common Estimation of Physicians, and next endeavours to shew how much it is.

By Blood, he understands both the Fluid in the Veins and Arteries, and that in the Lymphaducts, Nerves, or any other Vessel in the Body, they being all Parts of the Blood separated from it by the Force of the Heart, and many of them by the same Force return to it again.

He supposes the whole Body to be nothing but Tubes, or Vessels full of Blood, or Liquors separated from it, as is agreed by all who understand the Fabrick of the Body. He quotes *Leeuwenhoeck*, who says there seem'd to be above 10000 blood Vessels in the Space of 1 qr. of an Inch square, so that one cannot prick a Finger with the finest Needle but it wounds a Blood-Vessel. The Fibres of the Muscles (which make by far the greatest Part of the Body) are full of Blood, and the Fibres of the Bones have their Fluid.

After this, the Doctor shews the Proportion of the Fluids to the Vessels by a Figure, for which we refer the Curious to his Book.

He observes, that if the whole Body was compos'd of Veins or Arteries, it were easy to determine the Quantity of Blood; But since the Coats of the Arteries have a greater Proportion to their Cavities than the Veins have to theirs, and these again a greater Proportion to their Cavities than the Lymphatick Vessels to theirs; and since there may be one Proportion of the Nerves, another of the Fibres of the Muscles, and another of those of the Bones, the Doctor says, that all ought to be known before the Quantity of Blood can be exactly determined.

To this End he lays down Methods for finding the Thickness of the Coats of the Blood-Vessels, the Proportion of the Blood in the Arteries to the Coats of the Arteries, the Proportion of the Blood in the Veins to the Coats of the Veins, and how the Bulk of the Blood increases upon a small Increase of the Diameter of the Blood-Vessel; and from

from those Proportions he says a more exact Judgment may be form'd to what Degree the Blood is heated or rarified in Inflammatory Fevers by the Largeness of the Pulse, as also how small a Quantity of Blood must be thrown out at the Heart every *Systole* in Languid Fevers when the Pulse is small. Then he shews how prodigiously Aneurisms may dilate the Arteries, and how, when a large Trunk of an Artery in the Arm, Leg or Thigh, is tied, the small Arteries (which all communicate with one another) may dilate to carry on the Circulation of the Blood.

The Doctor says, the Fibres of the Muscles, tho' they may be more bulky, cannot be more numerous than the Arteries, since every Fibre must have at least an Artery, and 'tis probable it has several. He puts it beyond Doubt that they have considerable Cavities, since they swell, are blown up, and thereby much shorten'd when the Muscles act; and their Sides can be but thin, or else they could not be distended by so small a Force, nor would the Blood appear as plainly through them as it does through an Artery of equal Bigness. To make some Estimate of the Proportion of the Thickness of their Sides to their Cavities, he made the following Experiment:

He took a Piece of the Intestine of a Dog, with Part of the Mesentery and *Pancreas Ajelli*, and having carefully empty'd it, and weigh'd it with all the Blood in the Vessels, it was an Ounce and a half, one Dram, and eighteen Grains. Then he wash'd out all the Blood in the Artery with warm Water, blew it up, hung it to dry in the Shade, and in a Week's Time weigh'd it again, when 'twas diminish'd 637 Grains. But he says this Loss could be only of the Fluids, which being diluted with the warm Water, were the more easily evaporated; therefore if the Blood in every Part of the Body bore the same Proportion to the solid Part that it does to the solid Part of the Intestines, their Proportion would be 3.9 to 1, and a Body weighing 160 Pound, would contain 127 Pound of Blood; so that even the Fibres of the Muscles are less solid than the Arteries: But the Fibres which perform the peristaltick Motion of the Intestines, are firmer and harder than the Fibres of the Muscles.

Besides, the peristaltick Motion is perform'd by a very small Contraction of the Fibres, for which a very small Inflation will suffice; but the Contraction of the Fibres of the Muscles being great, they must be considerably inflated, and consequently more spongy, and capable of receiving more Blood than the Fibres of the Intestines; wherefore 'tis evident, that in the Muscles the Proportion of the Blood to the solid Fibres must be above 3.9 to 1, or almost as 4 to 1.

To know what Proportion the Fluids of the Nerves bear to the solid Part of the Nerves, the Doctor dried a Piece of the *Medulla Spinalis* without any Art or Preparation, except the sitting of it, and he found that it lost near 3 4ths of its Weight; from whence he infers, that the Nerves are not more solid than the other Parts. And as to the Lymphatick Vessels, he believes all will agree, that the Fluids in them bear a much greater Proportion to their Coats than what has been yet found.

He says, that the Bones have also their Fibres and circulating Juices: What else is the *Callus* which cements the Extremities of broken Bones? In it there are no Fibres nor Parts to be distinguish'd, but it appears like an uniform inspissated Juice; and the Doctor thinks it always circulates, though slowly, because whenever a Bone is broke, 'tis always at Hand. If it stagnated, it would harden, as it does when it is extravasated, and forms a *Callus*, and consequently all the Passages being obstructed, no broken Bone could unite. He says, this Juice is like the viscous Sap of Trees, and moves as easily through the Fibres of the Bones, as that does through the Fibres of an Oak, which he thinks evident from the Excrescencies of the very Substance of the Bones, their Nodes, Swelling, and Softening like Wax, of which several Instances are to be found in Authors even of Persons grown in Years. He grants, that the older we grow, the narrower are the Channels of the Fibres, the viscid Fluid hardening towards their Sides, and after Death entirely obstructing them, so that the whole Fibre appears solid; but still 'tis really no more a Part of the Fibre, than the Crust with which some Waters line the Pipes through which they run is Part of the Pipe. Besides, it may be taken out with-

without bringing away any of the Substance of the Bones in which 'tis contain'd. He instances in Hartshorn, whose Fibres and Substance remain undissolv'd after the Fluid or Jelly is extracted. To know what Proportion it bears to the Fibres of the Bones, the Doctor caus'd the Bone in the Knuckle of Peef, after boil'd, and the Marrow taken out, to be put into the Digester, when it weigh'd 22 Ounces 6 Drams and a half; but when 'twas taken out and dried, it lost above half its Weight, and yet the Texture of the smallest Fibre in the most spongy Part of the Bone was not broken, and the Middle or more solid Part appear'd to be made of parallel *Lamina*, of which four or five were scarce thicker than a Sheet of Paper; and he thinks, that if the Experiment had been made upon younger Bones, the Proportion of the Fluids to the solid Part would have been much greater. He also allows Fluid to the Tendons, Membranes, Ligaments and Cartilages, because they are much softer, and likewise yield a Jelly upon boiling; and thinks, there is not a Fibre in the whole Body in which some Fluid or other does not circulate, though hardening after Death, it cannot be extracted by any Elixation. In a Word, he concludes, that whosoever is acquainted with the Preparations of the Curious Dr. *Ruyssch*, would think the whole Body and all its Fibres were nothing but Blood-Vessels.

He determined the Quantity of Fluids in the Coats of the Arteries to be to the Coats as 1.7. to 1, by a Piece of the *Aorta* of a Calf, which weigh'd 240 Grains, and when dried but 80, and yet he does not suppose that any more than the thin Part of the Blood was exhale'd.

After this, the Doctor lays down a general Method for determining the Quantity of Fluids in the Coats of the Vessels, to which we refer.

If the Body is compos'd of Vessels whose Coats are made of other Vessels, and these again of others, as has been said, the Doctor infers, that the Bodies of the *Animalcula in Semine*, or the *Prima Stamina Vitæ*, may be increas'd to any Bulk, and the Coats of the Vessels, as far as we can discern, grow thicker and thicker without the Addition of any Substance to the Vessels, only by increasing

the Quantity of Fluid with which they are fill'd: For as the large Vessels swell, so likewise must the small ones, of which their Coats are compos'd down to the very last, and the Swelling of the several Orders of Vessels must necessarily increase the Thickness of the Coat of that Vessel which they compose; so that by increasing the Number of the Orders of the Vessels, the Coats of the first Order of Vessels may be increas'd to any Degree, and yet the Diameter of the Vessels which compose these Coats not greater than a given Line.

That the Coats of the great Vessels are compos'd of smaller Vessels is Matter of Fact, says the Doctor, and for ought we know the latter may be compos'd of other Vessels still smaller than themselves. Mr. *Cowper* says, every Membrane is vesicular, and may be blown into innumerable Cells. The *Cornea* of the Eye consists of as many parallel *Lamina* as the nicest Hand of the most expert Anatomist can raise.

The thin Membrane which involves the Brain divides it self into two *Lamina*; and the Doctor thinks, that the *Hydatides*, of which several are found one within another, are nothing but the Coats of the Lymphatick Vessels distended and separated by the *Lympha*, though the Coat of a Lymphæduct is so thin, that 'tis not visible but when distended with *Lympha*. *Leenwenhoeck* says, that the Fibre of a Muscle, which was 9 times smaller than a Hair of his Beard, was made up of 100 smaller Fibres, and yet each of these must have had Nerves, Veins and Arteries, and perhaps each of them made up of 100 more; but this cannot be discover'd by a Microscope, because only one Order can lie at a Time in the Forms of the Glass, and if more could, their several Refractions would confound the Sight.

If all the solid Part of the Body was contain'd in the *Animalcula*, then (says the Doctor) Accretion and Nutrition are nothing but the Repletion and Distention of the Vessels. He says, this Doctrine is rather confirmed than contradicted by Dr. *Woodward's* Experiments concerning Vegetation; for the fewer terrestrial Particles are contain'd in the Water by which any Plant is nourish'd, the quicker the Water passes off through the Pores or excretory Ducts of the Plant,

Plant, and consequently the Vessels are the less distended; but if the Water is impregnated with a large Quantity of terrestrial Matter, it cannot pass off quickly, but being retain'd in the Plant, the Vessels must be distended, and consequently the Bulk of the Plant increas'd. He observes, that Plants cannot thrive without proper Nourishment no more than Animals; for Life is continued, and all its Functions performed, by the straining off of several Sorts of Juices from the common Fluid, which in Animals is called Blood: But if that Fluid cannot afford these Juices, or is not fit to be turn'd into them, then that Body, whether vegetable or animal, must turn sickly and die. He adds, that some Sorts of Water are more easily transmuted into the Juices of some Plants than others, since some love a dry, and some a wet Soil, and some will grow in Water alone.

But the Doctor observes, that if the most proper Food can only distend, and not increase, the Substance of the solid Part of the Body, 'tis much more reasonable to suppose, that no Matter, howsoever disposed, can frame these solid Parts without the immediate Aduation of an Omnipotent Power.

He thinks what has been hitherto advanced, demonstrates the great Probability of that Supposition which the Reverend Dr. Clark uses to show the Possibility of the Resurrection of the same Body; because if all the solid Parts are no more than the original *Stamina*, and all Nourishment only a Fluid in a perpetual Flux, then no Part of an Animal Body can become Part of another, but the Body is always the same from the first Moment of Life to the last.

But whether the Coats of the Vessels are compos'd of others or not, the Doctor thinks his Experiments clearly demonstrate, that the Fluids in the Body are to the Solids at least as 3.9 to 1, so that in a Body weighing 160 Pound, there must be 127 Pound of Blood. But to put the Matter out of Dispute, he deducts the Weight both of the Fat and Bones, though he supposes the former circulates, as he has already shewn there is a Fluid in the latter.

He supposes, that in a Body weighing 160 Pound, the Fat is an Inch deep all round. Dr. Wainwright reckons the Surface of the

Body 15 square Feet, so that the Fat must be 180 cubick Inches, each weighing about half an Ounce; according to which Calculation, the whole Fat of a Man's Body weighing 160 Pound, is 5 Pound 10 Ounces; but our Author supposes it to be 7, and the Bones 20 Pound, and there remains 100 Pound for the Quantity of Blood in a Man weighing 160 Pound.

The Doctor proceeds next to give an Account of the Velocity of the Blood, which he determines thus.

The Velocity with which a Fluid flows out of any Orifice uniformly, and always running in the same Quantity, is equal to the Velocity of a Body which describes a Space of the same Length with that of a Cylinder, whose Basis is equal to the Orifice, and whose Magnitude is equal to the Quantity of the Fluid that runs out at the same Time. Now he supposes the Heart contracts 80 times in a Minute, and that each Contraction throws an Ounce of Blood into the *Aorta*. An Ounce of Blood is equal in Bulk to 1,659 Inch, and consequently 80 Ounces are 132,72 Inches. He says, the Diameter of the *Aorta* in a middle-sized Man is 0.73 Parts of an Inch, and its Orifice 0.4187. by which divide 132,72. the Quotient will be 316 Inches, or 26 Feet, the Length of the Cylinder or Space through which the Blood will go in a Minute, supposing it were constantly going out of the Heart with the same Velocity. But because of the *Dia-stole* of the Heart, which is at least half the time of a Pulsation, there go out 80 Ounces in half a Minute, and consequently the Velocity of the Blood is at least twice as great, or such as will make it to move at the Rate of 52 Feet in a Minute, the Doctor has therefore suppos'd that the Heart throws out but an Ounce of Blood every *Systole*, because that being allow'd of by all, gives the least Velocity; whereas if every *Systole* throws out two Ounces, as many do suppose, then the Velocity is double to what it has been here determined.

If the Sum of the Sections of the Branches of the Arteries were always equal to the Section of their Trunks, and if the Circuits in which the Blood moves were every where equal, the Velocity of the Blood would be every where the same it has been determin'd

mind'd to be in the *Aorta*. But 'tis certain that the Sum of the Sections of the Branches does every where exceed the Section of their Trunks, so that the Velocity of the Blood must decrease as the Number of Branches increases. He endeavours to find out this Truth by particular Computations, and Geometrical Proportions, to which we refer; and after all rests assured, that the last *Ratio* of the Branches to their Trunks falls much short of what he has found in several Places of the Body; and he is inclined to think, that the *Ratio* increases every Division from the great Arteries. But till this exact *Ratio* is discover'd by some nice and exact Measures of the Vessels taken after the Manner he proposes, he calculates the least Velocity, at the hundredth Division only, to be 100000000 times less than it is in the *Aorta*; which if so, the Blood in the last Division of the Artery moves one Foot, that in the *Aorta* 100000000 at the Rate of 52 Feet in a Minute, or 100000000 in 13354 Days, in which Time the Blood at the hundredth Division moves only one Foot, or it would be 278 Days in moving a Quarter of an Inch, if the last Branches were so long. But if the least Velocity is at the 70th Division, the Blood will move there at the Rate of a Foot in about 13 Days, and at the 50th at the Rate of a Foot in 3 Hours.

He observes, that as we are to conceive all the intermediate Degrees between the greatest and the least Velocity, so we are not to imagine that there is the least Velocity in every Evanescient Artery, but only in such as have 100 Divisions between them and the Great Artery, and the Velocity of the Blood in the Evanescient Artery is every where proportionable to the Number of Divisions between them and the Great Artery; and therefore in all the small Arteries which come immediately from the *Aorta*, and after a few Divisions transmit their Fluid to the Veins, the Velocity of the Blood is but a little diminish'd.

From hence the Doctor concludes, that when the whole Mass of Blood is to be alter'd, the Course of Physick ought to be continued for a long Space of Time; because the Blood moves slower and slower the farther it moves from a great Artery, and consequently it must be a great while

before the whole Mass of Blood can be mix'd with the alterative Medicine. And since the Circulation of the Blood through Glands which receive Arteries immediately from a great Vessel is very quick, they may carry off a great Proportion of the Medicine in a very little Time; and therefore the Doctor observes, 'tis not the taking of great Quantities, but a constant taking, that can alter the Mass of Blood; and that when the Blood is to be alter'd by Mineral Waters, which are apt to pass through the Glands of the Kidneys, they ought not to be drunk in large Quantities; for if they pass off, they have not the design'd Effect, and if they do not, being drunk in a little Time, they mix but with a small Quantity of Blood, which must disorder the Animal Oeconomy.

The next Thing the Doctor treats of is Muscular Motion.

He says, a Muscle is a Bundle of thin Plates of fleshy Threads or Fibres inclos'd by one common Membrane. All the Fibres of the same Plate are parallel to one another, and tied together at extremely little Distances by short and transverse Fibres. The fleshy Fibres are compos'd of other smaller Fibres, inclos'd likewise by a common Membrane. Each lesser Fibre consists of very small Vesicles or Bladders, into which he supposes the Nerves, Veins and Arteries, to open; for every Muscle receives Branches of all those Vessels, which must be distributed to every Fibre. The two Ends of each Muscle, or the Extremities of the Fibres, are in the Limbs of Animals fasten'd to two Bones, the one moveable, the other fix'd; and therefore when the Muscles contract, they draw the moveable Bone according to the Direction of the Fibres. When the Muscles contract in Length, they swell in Thickness; but this Power of contracting or swelling is lost, when either the Artery or Nerve of the Muscle is cut or tied; and therefore he concludes, that the Contraction, Swelling or Motion of the Muscles is perform'd by the Blood and Animal Spirits distending the Vesicles or Cavities of the Fibres. This Distention of the Vesicles of the Fibres must be either by their being fill'd with a greater Quantity of Blood and Animal Spirits than they were before the Contraction,

or the Blood and Spirits mixing must rarefy and fill up a greater Space.

He says, it will appear that the Vesicles of the Fibres are not distended purely by the Blood and Spirits, by considering, that were it so, Nature (whose Operations are always the most simple) had only us'd one Fluid, since in the Works of Nature there are no where two necessary Causes where one could have serv'd the same End. Now let the Quantity of the Fluid brought by the Nerves to the Muscles be never so small, that alone might have contracted the Fibres (if a Quantity only of a Fluid had been requisite) by diminishing the Diameters of the Cavities or Vesicles of the Fibres : And as it is evident, that the Reason why the Spirits alone do not distend the Vesicles is not for Want of a sufficient Quantity, so if there had not been a sufficient Quantity of the nervous Fluid, yet the Quantity of Blood could have given no Assistance in the Distention of the Vesicles ; for if they contain more Blood when the Muscles contract than when they are relax'd, it must proceed from the Blood's being stop'd in the Vein, or it must move suddenly with a greater Velocity through the Artery into the Cavities of the Fibres. If the latter, it must be by the Contraction of its Coats, or by some external Pressure upon them : If by the Contraction of the Fibres which compose the Coats of the Vein, the same Difficulty remains, since whatever be the Cause of the Contraction of the Fibres in a Vein, it will likewise serve to contract the Fibres of a Muscle. If the Blood is stop'd in the Veins by a Pressure upon their Coats, it must be by a Swelling of the Artery or muscular Fibres. If the Artery swells and presses on the Vein, the Circulation of the Blood must be entirely stop'd ; for that Pressure will constantly increase, the Blood being still accumulated in the Artery, and therefore it will for ever hinder all Passage through the Vein : But if the Blood moving sometimes quicker thro' the Artery into the Vesicles of the Fibres distends them, this greater Velocity must proceed from the Force of the Heart, from which alone the Blood derives its Motion. Now if the Heart acts with a greater Force, it will increase the Velocity of the Blood universally throughout the whole Body,

and its each Muscle and its Antagonist will be thereby equally contracted, and consequently neither will contract : And therefore since both the Blood and Fluid of the Nerves are necessary to the Contraction of the Muscles, and since the Contraction is not perform'd by the Quantity of these Fluids, it remains only that by their Mixture they rarefy and distend the Vesicles.

Now for the explaining of the Rarefaction of the Blood and Spirits in the Vesicles of the muscular Fibres, the Doctor supposes a small Globule of Air between the Particles of a Fluid, and that the Particles have a strong attractive Force by which they endeavour to come together, and pressing every way equally on the Globule of the Air, will hinder it from escaping any Way from between them ; but the Force by which they endeavour to come together being prodigiously greater than the Force of their Gravity, they will by this Force produce a very considerable Condensation of the Globule of Air that lies between them, and the Force of Elasticity being always proportional to its Condensation, the Force by which this airy Globule will endeavour to expand it self will likewise be vastly great ; and consequently if this *Nisus* of the Particles of the Fluid to come together should be taken off, the Air between them would expand it self with a very considerable Force. Now (says the Doctor) if upon the mixing of another Fluid, the Particles of the first should be more strongly attracted to those of the other, than they were before to one another, then would their *Nisus* to each other cease, and they would give the Globule of Air between them Liberty to expand it self, and the whole Fluid would take up a greater Space than before. But when the Particles of both Fluids come to be united, they will again inclose the Globule of Air between them, and by their mutual Attraction soon bring it to its former State of Condensation.

Now that the Blood contains a great Number of Globules of Air, is evident from the Quantity it yields in the Air-Pump ; and that the Particles of the Blood have a strong attractive Force, has been sufficiently shewn already. By this Attraction of the Particles the Globules of the Blood are

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form'd,

form'd, and in viewing its Circulation by a Microscope, the Doctor has observ'd, that where the Diameter of the Canal has been less than that of a Globule of Blood, the Globule would be press'd into a spheroidal Form; but when it came into a wider Part of the Canal, it would reassume its former Figure; which the Doctor attributes to a smaller Globule of Air inclos'd within, and expanding it self equally every way, when the Sides of its circumambient Shell of Blood are not longer press'd by the Sides of the Canal.

These Globules of Blood continually circulating through the Vesicles of the Fibres, (which probably can contain only one at a Time) meet with the Animal Spirits which drop from the Nerves. Now the Minuteness of the Glands of the Brain, and the Smallness of the Fibres of the Nerves, plainly show, that the Animal Spirits are a Fluid consisting of the smallest Particles of any in the Body, and therefore their attractive Force must be the greatest of all the Particles in the Blood; for which the Doctor refers to Sir *I. Newton's* Calculation about the Rays of Light; and consequently the Animal Spirits meeting with the Globules of the Blood in the Vesicles of the Fibres, and surrounding them, must attract the Particles of which they are compos'd more strongly than they do another; and consequently their *Nisus* to one another ceasing, the condens'd Globule of Air will expand it self with a very considerable Force, whereby each Vesicle of the Fibre will be distended, and so the Fibre shorten'd, i. e. the Muscle contracted. But when the Particles of the Globule of Blood are mix'd with the nervous Fluid, they will both together inclose the Globule of Air again, and compress it into as small a Space as before, and thus the Contraction of the Muscle must immediately cease, unless fresh Blood and Spirits still succeeding one another, continue the Inflation of the Vesicles. But when a Muscle has been strongly contracted for some Time, the Quantity of Spirits spent being more than can be received in the same Space of Time by the Glands which supply its Nerves, the Inflation of the Vesicles must fall, and the Muscle grow weak; whereas the tonic Motion of the Muscles being performed by

the Spirits, protruded only by the Quantity less fecern'd in the Glands, will constantly continue without any Weariness.

After this Manner he conceives the Vesicles to be distended without any Ebullition or Effervescence, and their Distention to cease without any Precipitation or Flying off of the aerial Globules through the Pores of the Muscles; and to this Attraction of the Particles of Matter he ascribes most of the *Phænomena*, for explaining of which, Philosophers have been forced to recur to active and subtle Principles, which (contrary to their own Principles) they have made to move and act as they please: But how they came by so great an Activity, is not to be accounted for from any of their Principles. Thus (says the Doctor) in explaining Muscular Motion, they make the Animal Spirits to cut the Globules of Blood with their sharp Points, that the imprison'd elastick *Aura* might be set at Liberty, which could not be effected, without supposing that there may be Holes in a fluid Globule, and that the fluid Particles stand in a Heap; and when the aerial Globule is got loose, the Intumescence of the Vesicle cannot be aswaged, but by supposing the elastick Globules now to have Strength to break through the Muscles and Skin to come at the external Air, though before they had not Power enough to pierce through a thin Shell of Blood.

The Doctor comes next to show the Mechanism of the Fibres. He says, each Fibre of a Muscle consists of a Multitude of small Vesicles, like a String of Bladders; and therefore the Contraction of the Muscle is always proportional to the Length of its Fibres; and since the greatest Contraction of the Fibres is always less than one Third of their Length, 'twas necessary that the Intersections of the Muscles should be near to the Joints, not only to increase the Velocity of the Parts moved, but that they might describe greater Arches round the Centers of their Motion.

Hence it is (says the Doctor) that those Parts which describe the greatest Arches are moved by the longest Muscles; as the Hand round the Elbow, which is bent by the *Biceps* arising from the *Scapula*, and the Foot round the Knee, by the Muscles whose Originations

ginations are as far distant as the *Ischium*; which Joints if they had been moved by short Muscles inserted at each End into the Extremities of the articulated Bones, the Arm and Leg had moved but a little Way, and the Arches the Hand and Foot had described about these Joints, had been to the Arches they describe now, as the Length of the short Muscles had been to the Length of the Muscles they have now. On the contrary, where the Joints have but a small Motion, the Muscles are short: Thus the Fingers are pull'd sideways by the *Interossei*, the Thigh is drawn outwards and obliquely by the *Quadrigemini* and *Obturatores*, which are all short Muscles, and most of those of the *Vertebrae* run between one *Vertebra* and the next.

The Vesicles of which the Fibres consist are extremely small; for though one large Bladder may raise a Weight as high as several small ones, yet the Quantity of elastick Fluid us'd in the Inflation, together with the Swelling of the large Bladder, will be

much greater than when a Weight is rais'd by a String of small ones. The Doctor illustrates this further by instancing in Bladders, to which we refer, and shall conclude with one Observation of his, that in determining both the Contraction and Strength of a Muscle, no Regard is to be had to the Tendons; because in them we observe no Inflation, and we find Nature no where making use of a Tendon, but where either there was not Room for the Insertion of so many fleshy Fibres, or where 'twas necessary the Muscle should draw from such a Point.

He concludes with an Essay how to determine the Force of the elastick Fluid necessary to distend the Vesicles, so as to raise any Weight to a determined Height. For this Purpose he endeavours to find out the Figure that each Vesicle will be form'd into by the Force of the elastick Fluid distending it. But we refer to his Book for the Method and its Solution.

Myographiæ Comparatæ Specimen: Or, A Comparative Description of all the Muscles in a Man, and in a Quadruped; shewing their Discoverer, Origine, Progress, Insertion, Use and Difference. To which is added, an Account of the Muscles peculiar to a Woman. By James Douglas, M. D.

THE Doctor says in his Preface, That though Myography has been often cultivated by good Hands, it still affords a large Field for Reformation and Improvement, as will appear by this small Treatise. He does not pretend to have corrected all the Mistakes, or supply'd all the Defects, of others who have wrote upon the Subject, and doubts not but he is liable to Correction in many Things.

But he was encouraged to publish this Book, because he took all his Descriptions

from ocular Inspection in dissecting, without taking any Thing upon Credit from others. Before he was determined as to the Origine, Progress and Insertion, of the Muscles, he rais'd them on both Sides of above 12 Subjects, both *Fetus's* and Adults, wrote down his Observations, and perused all that have wrote upon Muscles from the Time of *Galen* till now. After comparing the Descriptions together, he singled out such as he found conformable to the Life, that being the Standard by which he directs himself, and

according to which he has rectify'd the Mistakes, and supply'd the Defects, of others, as far as his Observations go.

He takes Notice, that in the many Bodies he has view'd, he has not met with that Frequency of *Lusus Naturæ* so commonly talk'd of, especially by those who are loth to take Pains to make a strict Inquiry in the Dissection of those useful Machines of Motion; yet he owns that Nature does sometimes sport and vary in the Composition of a Muscle. Thus he has observ'd two *Palmaris's* in one Hand; he has found three Heads to the *Biceps Cubiti*, the uncommon Head arising from the Middle of the *Os Humeri*; and he has seen one of the *Interossei* come from the upper Part of the *Carpus* externally, &c.

As for the Comparative Part of this Treatise, or the Interlacing the Descriptions of the Humane Muscles with those of the Canine, he presumes it needs no Apology. The many useful Discoveries from the Dissection of Quadrupeds is a warrantable Plea for insisting upon it, tho' it may be censur'd by the Vulgar.

He was induced to make the Parallel between the Muscles of a Dog and a Man for two Reasons:

1. The Opportunity of shewing the Contrivance and Use of the Muscles subservient to the peculiar Motions of a Dog, and such as its different Way of Living did necessarily require; for where Nature has acted uniformly, he is silent; but when any Difference appears in respect of the Origine or Insertion, there he makes Comparative Remarks.

2. For the Benefit of young Students of Anatomy, who may readily procure so common a Subject, and if they once acquire a Dexterity of raising the Muscles in it, may promise themselves an equal Ability in raising those of the Humane Body after the Dissection of one or two at most. He quotes *Galen* for his Pattern, who recommended to his Scholars the frequent Dissection of Monkeys and Apes, as highly conducive to a more perfect Knowledge of the Structure of the Organs of the Humane Body; and he observes, that the Descriptions of the Muscles in his *Administraciones Anatomica*, and in his Book *de Dissectione Musculorum*, are chiefly

taken from Apes; but the Account of the Use of them in his admirable Book *de Usu Partium* are all taken from Men.

The Doctor uses the same Method that's follow'd at *Surgeons-Hall* in *London*, which he says is the most illustrious School of Anatomy now in *Europe*.

All the Muscles discover'd and describ'd by *Galen* stand here without any Name or Mark affix'd, to the others he adds the Names of their respective Discoverers, and those which he has discover'd himself have three Stars set after their Names.

In his Introduction, he gives a short Account of the Structure and Composition of Muscles in general, and premises what is meant by a Fibre and a Membrane. A Fibre, in Greek 'tis, in Latin *Fibra*, is properly those *Villi* or Strings that hang at the Roots of Plants, but in Anatomy may be described, a Substance in Figure like a fine Thread, of a tensil and irritable Nature, by the various Texture and Combination of which, all the solid Parts of the Humane Body are framed.

These Fibres are divided into Membranous, Carnous, Cartilaginous, Osseous and Nervous. The Doctor only describes the Carnous, which he says are vascular and hollow, full of little Cells, and call'd *Fibræ Motrices*, because the chief Organs of Muscular Motion. The Fibres are also distinguish'd, by their Situation and Course, into *Straight*, which run lengthways or in right Lines; *Circular*, which run round some Part; *Transverse*, which intersect straight ones at different Angles; or *Oblique*, which cut both the straight and transverse at unequal Angles.

A Membrane is a broad, thin, white, dilatable Substance, interspers'd with several Sorts of Fibres like a Web. In Greek 'tis call'd *ὑμὴν*, *χίλον*, and *μενινγξ*, which *Hippocrates* and *Galen* use indifferently to denote one and the same Thing; but later Writers appropriate them to particular Membranes. Thus *Hymen* is applied only to the circular Fold of the inner Coat of the *Vagina Uteri*, placed near its outer Orifice; *Meninx* to the Membranes that involve the Brain; and *χίλον* still denotes a Membrane or Coat. In English, Membrane in a large Sense comprehends all the Coverings that invest the solid or contain the fluid Parts, with different Names

according to the Parts they inclose. Thus that which covers the *Cranium* or Skull is call'd *Pericranium*, that which lines the Inside of the *Thorax*, *Pleura*; that which invests the *Abdomen*, *Peritoneum*; that which adheres to the Surface of all the Bones, *Periosteum*. Besides that the Membranes of some particular Parts have particular Names.

All the Membranous Fibres have a Sort of Elasticity or Spring, whereby on Occasion they can very easily extend and contract themselves again, as may be observ'd in the *Peritoneum*, *Stomach* and *Uterus*. The Nervous Filaments interlaced between them, and pouring in the Animal Spirits, make them extremely sensible, whence the Ancients were led into a Mistake, in affirming that the Membranes were the true Organs of Feeling.

Every Membrane is manifestly double, and between the Duplicature the Vessels run; and in the Fissure of their inner Membrane there are placed Abundance of small Glands, which separate an Humour for moistening them, and thereby hinder preternatural Adhesions to the Parts they touch, which always happen to any of the *Viscera* affected with a *Scirrhus*, which in such a Case adheres firmly to all the neighbouring Parts.

The Use of the Membranes is to wrap up and cover the Parts, to strengthen them, to defend several of them from being hurt by the subjacent Bones, to sustain the Vessels that are ramified upon them, to keep the Parts united; and 'tis worth our Observation, that the admirable Sympathy or Consent of the Parts one with another depends in a great Measure upon their fibrous Connexions.

All that soft Part of the Body the Vulgar call Flesh, is by Anatomists distinguish'd into various Parts or Parcels, which they call Muscles.

A Muscle is nothing but a Bundle of fleshy and tendinous Fibres inclos'd in a proper Membrane, by Means of which all the Motions in an Animal Body are performed.

The Greek Name is *Mus*, i. e. Mouse, because some of them are like that Animal when strip'd of its Skin; or others derive it from *μωρε*, to contract, which is the proper Action of a Muscle.

A Muscle is commonly divided into the Head or Beginning, Body or Belly, and Tail or Ending; or into the Middle, and two Extremities. The Head is that which arises from the most stable Part, unto which the Contraction is made; for 'tis a constant Rule, that every Muscle moves towards its Beginning, which from thence may be call'd the Center of its Motion.

The Origine of a Muscle is for most part tendino-carnous, sometimes entirely tendinous, and sometimes only fleshy.

The Tail or End is that Part implanted into the Member which is to be moved. This Extremity is commonly call'd its Tendon, the Substance of which is the same with the rest of the Muscle, only its Fibres being closely compacted, for the Convenience of having a greater Number of them inserted into a narrow Place, they feel harder and appear whiter; so that the fleshy Fibres of a Muscle are only its Tendons divided and loose, and the Tendon is nothing but these very Fibres closely united, as *Spigelius* expresses it.

'Tis probable that every Muscle either begins or ends tendinous, (with this Difference, that some of them end in the *Periosteum*, though the greatest Part do penetrate that Membrane, and are immediately inserted into the Bone) the stronger and more conspicuous being extended beyond the fleshy Part, and not so discernable, lie either hid under the Flesh, or interlaced between its Fibres.

'Tis necessary to know that the Head and Tail of a Muscle are convertible Terms; for according to the different Situation of the Body, those Extremities do so alter, that the Part which was before immoveable and fix'd becomes moveable.

The Belly of a Muscle is the middle Part of it, which consists of fleshy Fibres, red, lax and spongy, as may be distinctly observ'd in a Piece of parboil'd Flesh. Each Fibre is made up of a vast Number of little *Fibrilla*, which are so many slender hollow Pipes bound about by small transverse parallel Threads, which divide the *Fibrilla* into a great many *Vesiculae*, that have no Communication with one another, but only entertain the Blood and Spirits for the Action of the Muscles. The red Colour of the
Fleshy

fleshy Fibres is owing to the Blood they receive; for upon injecting warm Water plentifully into the Arteries, the Redness abates, and the Fibres put on the same Colour with these distractile Tubes.

The proper constituent Parts of a Muscle are those already described.

The common are Arteries, Veins, Nerves, Lymphaducts and Fat. The Arteries impart the Blood, the Veins convey it back to the Heart. The Nerves bring Animal Spirits upon any Impression communicated to them from the Mind. The Lymphaducts perhaps carry back the Remains of the nourishing Juice to be refunded into the Venal Mass; and the Fat between and upon the Fibres lubricates and renders them fitter for Action.

A Muscle is either single or compound. In the first, all the fleshy Fibres run parallel to one another; in the latter, they run in several Planes, crossing one another, or in different Courses.

All Muscles which serve for the same Motion are call'd *Congeneres*, because they assist one another in Action; and these which are the Instruments of opposite Motions are named *Antagonista*. For Instance: Every *Flexor* or bending Muscle has a *Tensor* or extending Muscle; and 'tis a constant Observation, that when one of these Muscles is shorten'd, the other is extended; for the Shortening of the Muscle which acts, must needs produce an Extension of its Antagonist.

The Use of the Muscles is to perform all the different Motions of the Parts by contracting themselves; for when the *Fibrille Morrices* are shorten'd, the moveable Part must of Necessity be drawn towards the fix'd, or the Part from which the Muscle does spring, and that into which 'tis inserted must needs be brought nearer each other. So much for the Introduction.

We come now to the Book it self, which being design'd only as a Manual for Students who attend Anatomical Lectures, &c. 'tis enough to give a brief Account of its Contents.

The First Chapter treats of the Muscles of the *Abdomen*, viz. the *Obliquus Descendens*, *Obliquus Ascendens*, *Pyramidalis*, *Rectus*, and

Transversalis; and his Method is to give an Account of their Origine, Insertion and Use, which he observes in every Chapter.

The Second treats of the Muscles of the *Testes*, viz. the *Dartos* and *Cremaster*.

The Third of the Muscles of the *Penis*, viz. the *Erector Penis* and the *Accelerator Urinae*.

The Fourth of the Muscles of the Skin of the *Os Occipitis* and *Os Frontis*, viz. the *Musculus Frontalis verus seu Corrugator Coiteri*, and *Occipiti Frontalis*.

The Fifth of the Muscles of the Eyelids, viz. *Aperiens Palpebrarum Rectus* and *Orbicularis Palpebrarum*.

The Sixth of the Muscles of the Eyes, viz. *Obliquus superior*, *Obliquus inferior*, *Elevator*, *Depressor*, *Adductor* & *Abductor*.

The Seventh of the Muscles of the Nose, viz. *Rineus vel Nasalis*.

The Eighth of the Muscles of the Lips, viz. *Zygomaticus*, *Elevator Labiorum communis*, *Depressor Labiorum communis*, *Sphincter Labiorum*, *Elevator Labii inferioris proprius*, *Elevator Labii superioris proprius*, *Depressor Labii inferioris proprius*, & *Depressor Labii superioris proprius*.

The Ninth of the Muscles of the Cheeks, viz. *Buccinator*, and the *Quadratus Genae vel Latissimus Colli*.

The Tenth of the Muscles of the External Ear, whose Number he says is uncertain.

The Eleventh of the Muscles of the Internal Ear and Auditory Passage, viz. *Externus Auris*, *Internus Auris*, *Obliquus Auris vel Externus*, *Stapedeus vel Musculus Stapedis*, & *Musculus Meatus Auditorii*.

The Twelfth of the Muscles of the *Os Hyoides*, viz. the *Mylohyoides*, *Geniohyoides*, *Stylohyoides*, *Stylo-Chondrohyoides vel Stylohyoides alter*, *Coracohyoides*, & *Sternohyoides*.

The Thirteenth of the Muscles of the Tongue, viz. the *Genioglossus*, *Ceratoglossus*, *Styloglossus*, & *Lingualis*.

The Fourteenth of the Muscles of the *Larynx*, viz. the *Hyothyreoides*, *Sternothyreoides*, *Cricothyreoides*, *Arytanoides major*, *Arytanoides minor*, *Cricocarytanoides posterior*, *Cricocarytanoides lateralis*, & *Thyreocarytanoides*.

The Fifteenth of the Muscles of the *Pharynx*, viz. the *Cephalopharyngeus*, *Chondropharyngeus*,

pharyngeus, Cricopharyngeus, Gloss, Hyo, Mylo, Pterigo, Salpingo, Syndesmo, Stylo, & Thyreopharyngei.

The Sixteenth of the Muscles of the Uvula, viz. the Gloss, Palato, Salpingo, & Thyreostaphilini.

The Seventeenth of the Muscles of the Tabula Eustachiana, viz. the Musculus Tabæ novus vel Palatosalpingæus.

The Eighteenth of the Muscles of the Head appearing or situate in the fore and lateral Parts of the Neck, viz. the Mastoideus, Rectus internus major & minor, Rectus Lateralis, & Musculus Caput concutiens.

The Nineteenth of the Muscle of the Neck that lies on its fore Part, viz. the Longus.

The 20th of the Muscles of the Lower Jaw, viz. Temporalis, Masseteri, Digastricus, Pterigoideus internus & externus.

The 21st of the Muscles of the Thorax, viz. Scalenus, Subclavius, Intercostales, Triangularis, Diaphragma, & Costarum Depressores proprii.

The 22d of the Muscles of the Bladder of Urine, viz. the Sphincter and Detrusor Urinæ.

The 23d of the Muscles of the Anus, viz. the Levator magnus seu internus, & parvus seu externus, and Sphincter.

The 24th of the Muscles of the Scapula, viz. the Trapezius seu Cucularis, Elevator seu Musculus Patientia, & Rhomboides.

The 25th of the Muscles of the Thorax that appear in the Dissection, the Body lying prone, viz. the Serratus major & minor anticus, Serratus superior & inferior posticus, Sacro Lumbalis Cervicalis Descendens, & Costarum Levatores.

The 26th of the Muscles of the Head that appear in the prone Position of the Body, viz. the Splenius, Trachelo-Mastoideus seu Capitis Par tertiam, Complexus, Rectus major & minor, & Obliquus superior & inferior.

The 27th of the Muscles of the Neck that lie on its back Part, viz. Spinalis, Transversalis, Interspinales, Intertransversales.

The 28th of the Muscles of the Back, viz. the Longissimus, Semispinalis, & Transversales Dorsi interiores.

The 29th of the Muscles of the Loins, viz. Spinalis, Transversalis Lumborum, vulgo

Sacer, Quadratus, Psoas parvus, & Intertransversales.

The 30th of the Muscles of the Humerus or Arm, viz. Pectoralis, Deltoideus, Supraspinatus, Infraspinatus, Teres minor & major, Latissimus Dorsi, Coracobrachialis, Subscapularis.

The 31st of the Muscles of the Cubit, viz. Biceps internus, Brachialis internus & externus, Brachialis externus, Angonæus vel Cubitalis.

The 32d of the Muscles of the Palm of the Hand, viz. Palmaris longus & brevis, or Caro-quadrata.

The 33d of the Muscles of the Wrist, viz. the Flexor Carpi Radialis, Flexor Carpi Ulnaris, Extensor Carpi Radialis, & Extensor Carpi Ulnaris.

The 34th of the Muscles of the Four Fingers, viz. the Perforatus, Perforans, Lumbricales, Extensor Digitorum communis Interossei.

The 35th of the Muscles of the Forefinger, viz. the Extensor secundi Internodii Indicis proprius, vulgo Indicator, Extensor tertii Internodii Indicis, & Abductor.

The 36th of the Muscles of the Little Finger, viz. the Extensor Minimi Digiti, tertii Internodii Minimi Digiti, Abductor Minimi Digiti, Hypothenar, Flexor primi Internodii Minimi Digiti.

The 37th of the Muscles of the Thumb, viz. Flexor primi, secundi & tertii Internodii, Extensor primi, secundi & tertii Internodii, the Adductor ad Indicem, & Antithenar ad Minimum Digitum.

The 38th of the Muscles of the Radius, viz. Pronator teres & quadratus, and the Supinator longus & brevis.

The 39th of the Muscles of the Thigh, viz. Psoas magnus, Iliacus internus, Pectinalis, Gluteus maximus, medius & minimus, the Pyrriformis seu Iliacus externus, Marsupialis seu Obturator internus & externus, Gemini, Quadratus Femoris, Triceps, Abductor Femoris primus, secundus, tertius, quartus.

The 40th of the Muscles of the Os Occygis, viz. the Coccygeus.

The 41st of the Muscles of the Leg, viz. Membranosus, Sartorius, Rectus, Vastus externus & internus, Crureus, Gracilis, Semimembranosus, Semimembranosus, Biceps, & Popliteus.

The 42d of the Muscles of the Foot, viz. Extensor Tarsi suralis vel Extensor magnus, Extensor

Extensor Tarsi minor, vulgo Plantaris, Tibialis anticus, Tibialis posticus, Peroneus primus seu posticus, & Peroneus secundus seu anticus.

The 43d of the Muscles common to the Four lesser Toes, viz. *Extensor longus & brevis, Perforatus seu Flexor sublimis, Perforans seu Flexor profundus, Lumbricales, Interossei.*

The 44th of the Muscles of the Great Toe, viz. *Extensor longus & brevis, the Flexor longus & brevis, the Adductor & Abductor.*

The 45th of the Muscles of the Little Toe, viz. *Adductor & Flexor primi Internodii Minimi Digiti.*

The 46th of the Muscle common to the

Great and Little Toe, viz. the *Transversalis Pedis.*

After this, there's an Appendix concerning the Muscles of the Clitoris and Vagina in a Woman, a List of the Muscles found in a Humane Body that are not met with in a Dog, a List of those peculiar to a Dog, and an Etymological Table of the Muscles; an Account of what the Doctor obliges himself to perform in a Course of Humane and Comparative Anatomy, and an Appendix to his foregoing Account of the Muscles.

Adversaria Anatomica, Medica, Chirurgica. Taken from some scatter'd Pieces of Dr. Frederick Ruysch, Mr. John Jacob Raw, Mr. Guevelon, the Two Adrians, Father and Son, Mr. Catuve, &c.

I. IT is observ'd from *Ruysch*, that the *Officula* or little Bones of Hearing (which may seem strange) are of the same Size in the Skulls of every *Fœtus* with those of grown Persons. It is likewise observable, contrary to *Valsalva*, the last Author that has writ of a Humane Ear, that the *Officula* of Hearing are cover'd with the *Periosteum* and its Vessels; but *Valsalva* admits Vessels, but not the *Periosteum*, which is contrary to all other Anatomists: For the Vessels are always concern'd for Nourishment, for which End the *Periosteum* is always appointed to the Bones. The Cavity under the *Sella Equina*, or four Processes of the Bone *Sphenoides*, or Wedge-like Bone, in Adult Skulls is supplied with a slender Membrane or Film; and Dr. *Ruysch* in several Subjects has observ'd, from this Cavity there is a *Foramen* or Aperture into the spongy Bones of the Nose, with which also that Tunicle which is in the Cavity seems to communicate. In new born Children, no Cavity appears under the *Sella Equina* or Processes of the *Sphenoides*.

II. Concerning *Highmore's* Cave or Cavity, which is internally discover'd in the *Sinus* of each Maxillary Bone, it is observable, Surgeons and unskilful Anatomists are frequently mistaken, who, if a Hurt be violent or successive in these Parts, as it commonly happens in the Venereal Disease, take this for a *Caries* or Rottenness of the Bone, especially when they can penetrate so deep into it with a Probe, and find this vast Cavity.

III. In a little dead Body newly born, which was dissected the 27th of Dec. 1707. the Navel-string, as it was observable, stuck close to the Urinary Bladder by Means of the *Urachus*: But the *Urachus* is nothing but the Suspensory or Ligament of the Bladder, without Perforation or other Use, which will appear if you blow Wind into the Bladder, whence you will find the *Urachus* not swell at all, but end about the Navel, which, with its adjacent Vessels, after the Exclusion of the *Fœtus* becomes a Ligament. Sometimes the Skin about the Navel in new born Infants is observed to be too thin, and will

will rise on a round Knot, as if it had a transparent Liquor in it; but in few Days after their Birth Mr. *Ruyfch* has oftentimes observ'd them disappear.

To know the Distinction of Sexes in Skeletons is something difficult; but if we enquire, it is chiefly to be observ'd in that *Chink* upon the joining together of the Bones of the *Os Pubis*, which is form'd from the Bones of the *Iscium* or *Huckle-bones*, for these yield more in Women than in Men. But if this Fissure or *Chink* be straighter than ordinary in Women, 'tis to be fear'd they will have great Difficulty in Child-bearing, from which they seldom escape; for this is called the Womb Looking-glass: Neither is it in this or any other Cases of other Concern. Otherwise, to consider the Reason of Distinction of Sexes, we ought to have particular Regard to that Difference that is in the Ribs, which are broader in Women, and straighter in Men. The Circumference of the Bottom of the Hip-bones is of larger Extent in Women too.

It happens more frequently that the Neck of the Thigh-bone is broke by some external Violence than a great many People believe; for the Bones are very slender in this Part, and the *Lamella*, as they are call'd, brittle like Glass: And although it is the common Opinion of Patients, that the Pain and Loss of Motion proceeds from the Exarticulation or Disjointing of the Thigh-bone from its Union with the Huckle-bone, yet that is a false Notion, and impossible that the Articulation can suffer a Luxation, by reason of the Thickness and Strength of the Ligaments and circumjacent Tendons. I saw a Fracture, says my Author, and felt it with my Hands in the dead Body of a Woman at the Hospital in *Amsterdam* call'd the *Pesthouse*, which in Course of Time had consolidated again by a *Callus* in the Neck of the right Thigh-bone, yet the Woman was sound, and had the Use of the Part to her dying Day. A *Callus* the Breadth of ones Thumb may be under the great Head of the Thigh-bone; but there can be no Hurt or preternatural Constitution in the Ligaments and Tendons of the Muscles, all Things are so firmly knit together, and the injured Place so well consolidated by the *Callus*, that though it be us'd with never such Violence, it cannot be

broke. Notwithstanding, it is not to be affirm'd that the Tendons of the Muscles in Fractures, although they unite again, can bear as much as before, or be able to sustain the usual Motion of the Feet; to say nothing of the Nerves that occur to this Labour, whose chief Heads proceed or issue from the *Os Sacrum*, and the said Parts of the Tendons and Ligaments.

As to other Fractures of the Bones in general, Mr. *Ruyfch* has observ'd, that such Men who are in an ill Habit of Body, of a scorbutick Constitution, or whose Juices are sly, and want those uniting Particles necessary for the Accretion and Strength of the Bones; in such Cases, Fractures will never rightly consolidate. He hath seen others in which the spongy Part of the Bones or *Medullium* adheres; but the external *Lamina* of the Bone not being equally hard, upon every light Occasion is subject again to *Fractures*. For both of these Evils he has thought it sufficient to apply Iron Plates towards fortifying the weak Parts.

A *Paracentesis* or Perforation of the *Thorax* or Chest in an *Empyema* is rarely made with the desired Success, because the purulent or corrupted Matter is inclos'd in a cavernous Bag, and sticks to the *Pleura* among the *Intercostal Muscles*. Mr. *Ruyfch* thought it expedient, instead of a Penknife or Incision-knife, to apply a Potential Cautery to the third and fourth Ribs, to be reckoned from the lowest. The best Caustick for this Use, is that made of Quicklime and a *Lixivium* of Soap Ashes, form'd into the Consistence of a Stone. He advises concerning Trepanning, and informs the World that he always treats the wounded Part with Cephalick Fomentations for 24 Hours; and if in that Time the Symptoms did not abate, then at last to proceed to the *Trepan*, which is an Operation very troublesome and difficult.

The 13th of *January*, 1706. the publick Hospitals afforded the Body of a Woman who died in Child-bed, and this was for Information to the Midwives, the Magistrates of *Amsterdam* having ordered that there should be frequent Dissections of this Kind for the Improvement of the Art of Midwifery. But before Mr. *Ruyfch*, whose Business this was, demonstrated the Subject to the

Midwives, he shew'd the Scholars that were his Pupils the most rare Anatomical *Phænomena* of the Parts. The Womb appear'd in Women with Child towards the upper Parts of the *Moon* and *Jejunum*, and thrusts up the *Liver*, *Stomach* and *Diaphragm*, into the *Thorax*, so that it is difficult for them to breath. The Womb being cut in Form of a Cross, appears as thick as it was before the Impregnation, although it has admitted of that prodigious spherical Extension; which may seem incredible to those who do not consider the vast Swelling of the middle Vascular Tunicle of the Womb, which grows every Day successively with the *Fætus*. The Tunicles of the Womb are properly Three: The outermost is smooth, the middle spongy and full of Blood-Vessels, and the innermost soft and glandulous, to which the After-birth is fix'd, tho' not very firmly, and these are united to the Membranes in which the *Fætus* is wrap'd. Those two Membranes are the *Chorion* and the *Aminios*, which at first Sight may seem to be but one, and yet with little Difficulty may be separated from one another with the Fingers. In this Subject, the *Fætus* appear'd just ready for Exclusion, from whence might be observ'd the inward Orifice of the Womb by a little Dilatation, the Largeness or Size of which Orifice would at this Time admit two Fingers. I took particular Notice of the *Placenta* or After-birth, that it was not so grumous and divided as it seem'd after Extraction from the natural Part, when it had been touch'd by the Midwife's Hands. It is cover'd with a peculiar Membrane, which Mr. *Ruyseh* calls *succous* or juicy, with the Membrane of the *Chorion*, and a continued Inosculation of the Substance of the Womb. In the Neck of the Womb of this Child-bearing Woman, we observ'd several gaping Pores about the Orifice of the *Urethra*, with which sometimes unskilful Surgeons are deceived in searching for the Stone, and taking these for the *Urethra*; which Error they may easily rectify, by knowing that the Orifice of the *Urethra* is situated just a Thumb's Breadth from the *Clitoris* in a right Line. It is singular what the Famous *Ruyseh* has observ'd concerning *Fallopian's* Tubes, to wit, that in those Women who have lately conceived, that Tube by which the inflamed

Egg pass'd does appear to have a Cavity conspicuous at its Inosculation with the Womb.

As long as the *Fætus* is shut up in the Confiner of the Womb, it is difficult to pass a Judgment of Life and Death, which is yet highly requisite at the Time when the Question arises, Whether the Mother should not be saved by extracting the Child by Force? Neither is there any Sign of the Child's being dead in the Womb so sure, as that which is taken from the Navel-string; for if it be flabby, and have lost its Pulsation, you may proceed safely to work, and discharge your Conscience. Mr. *Ruyseh* has said, that the Sign of a dead Child is taken from the Lungs, which remain smooth; but if the Body has been dead some Time, and expos'd to the free Air, it shall so change the Structure of the Lungs by a supervening Fermentation, that they will swim above Water, notwithstanding the Child was dead in the Womb; but if it so happens that the Child expires in the Neck of the Womb, during that Time it shall not be capable of receiving any Air into the Lungs.

Before I proceed further with the Dissection, I shall observe to you something of Abortions, which have been procur'd by wicked and vile Prostitutes: Some, to save their Modesty, still pass upon the World for chaste Virgins; and others to prevent the Charges of the Prosecution of the Law. For the Love and Value some set upon Reputation and a good Name is so great, that they will sell their Consciences and Religion to purchase that; and a little stolen Pleasure, especially in the Acts of Venery, is esteem'd by some Women worth their hazarding both Soul and Body for in this World. What a vast Number of Souls perish by the Artifices of Poison, and other foul Practices to destroy the *Embryo's*, it may be after three or four Months being gone with Child? But if it happens, that, through Ignorance or imprudent Negligence, they go out their whole Time, and bear a Child alive, what Machinations and Devices are there made to thrust it out of the World, and what they could not effect before the Birth with Craft, they make up afterwards with Cruelty? I tremble when I call to Mind what *Patimus*, who was an incomparable Philosopher and Phy-

Physician, has said in some Letters of his writ in the *French Tongue*. A Letter to Mr. Falconet, 1660. the 27th of July; and another printed at Paris in the Year 1692. where he takes Notice of a Midwife, who in his Time had her publick Punishment suspended, though she had killed a *Fœtus* by perforating the Womb of a certain Woman by an Instrument to procure Abortion, or a Miscarriage, but with such unhappy Success, that the Mother being seiz'd with Convulsions, expired in a great deal of Misery. This wicked Midwife, in her Confession before the Criminal Judge, own'd, that she had by this Method successfully procured Abortions in many Women.

Upon another Occasion, Mr. *Ruyseh* form'd a demonstrative Discourse upon Blood-letting. It is observable, that the most common Places to take Blood are in the Cephalick, Basilick, or Middle Veins of the Arm. The Cephalick or Head Vein is seated on the Outside, as the Basilick is on the Inside, of the Arm. But where these two Veins meet by the *Anastomosis* of their Trunks, which is below the Bending of the Arm, there the Middle Vein arises, which is not so commonly cut as the ignorant Vulgar think, for sometimes it is hid under the Muscles; but the Cephalick is most commonly cut, or a Branch of it, in the Bending of the Arm, or a little above; for the Basilick, or, as it is called by some, the Hepatick, is more dangerous to cut, by reason of its adjacent Nerves, or the tendinous Part that lies under it, which forms the Muscle call'd the *Biceps*, being the first Muscle of the *Cubitus*, and being wounded, produces grievous Symptoms.

In the Demonstration of the Parts serving for the Secretion of Urine, and the Use of the Bladder, he propos'd a curious and choice Observation of the falling down of the Bladder into the *Scrotum* or *Cod*, which he solemnly attested he had met with twice in his Practice: And that the Bladder descended the same Way into the *Scrotum* that the Guts us'd to do in a Rupture; and that the most certain Sign of this Effect was, when the Party could not make Water without squeezing the upper Parts towards the *Scrotum*.

These were the Things which I took No-

tice of from the Famous Mr. *Ruyseh's* own Mouth in his Lectures and Observations that he made to his Scholars. I shall now speak of another Master of mine, Mr. *John Jacob Raw*, an Ornament and Glory to his Country, a most incomparable Anatomist and Surgeon, who in his Judgment and Experience in Cutting, may be allow'd even to excel the dextrous and diligent *Vesalius*. I pursued the Directions and Precepts of this extraordinary Man near five Months in Anatomy and Surgery: Therefore what I shall communicate are the Observations of that finish'd and compleat Anatomist, and those Things which appear'd most remarkable from his Institutions and Instructions. There are Abundance of other Things which that eminent Anatomist might do, to expose the Cheats and Errors that Pretenders to Anatomy make use of; if he would publish them, they would contribute to the Admiration of all, as well as the Health of many Thousands, and the Honour as well as Proficiency of the Art. But if these trifling Lucubrations of mine, and this little Essay of Anatomy should come before so considerable an Anatomist, I hope he will not judge hardly of me, that I have not been ashamed to publish some particular Thoughts and Notions of his. But I solemnly protest, I do this out of a publick Esteem, that the Students of Anatomy may see the Tracks and Footsteps of Anatomy truly taught, that which is really Natural, and not that which is daub'd or gilded over with false Colours by such Anatomists as have got a Reputation without deserving it, but impose upon their Scholars or Disciples for Want of a true Foundation of solid Experience and Observation.

Mr. *Raw* has made an excellent Discovery of the true Seat of the Articulation of the Lower Jaw-bone with the Upper in a *Skeleton*; for this has been a constant Error in all *Skeletons*, and natural Draughts, the Lower Jaw-bone seeming to be articulated in that Place where the Clinoide Cavity meets with the Inside of the Bones of the Temples, great Part of which in a living Subject is almost always replete with Fat, and the Space gives Way or yields to the uniting *Apophyses*, but in Motion especially, to wit, that the Lower Jaw-bone might move backward.

with out Impediment : But the true Place of the Articulation is near the *Zygomatick Process* or Jugal-bone, about the Temples, in a transverse Eminency, to which the Cartilage intervening, we may plainly see the Lower Jaw-bone articulated. But if from a Fall or other Accident the Lower Jaw be disjoined, then it may be that almost all the *Condylode* or uniting Process sinks into the *Clinode* Cavity : But this happens only in a preternatural State, and then the Man is hinder'd from Chewing, except by the Assistance of a dextrous Surgeon, the Lower Jaw-bone be stretch'd out, and reduced to its former Place.

Of the *Maxillary* Bone properly so call'd, or the Upper Jaw-bone, which is a little straighter than the other, and has an Orifice opening into the Nostrils. He has assign'd the same Use to this *Sinus* or Duct, as to the *Frontal* and *Sphenoide* Ducts ; not, in the first Place, as those are made to form the Sound of the Tone ; but, in the second Place, to serve for restoring the Mucous to the Nostrils ; for the said *Sinus's* are indeed nothing else but Receptacles for the Mucous of the Nose, so that there may be Plenty of that at all times, which flowing every where from hence, in whatever Position the Head is placed, it may sufficiently water the *Pituite Membrane*, investing the little Cells of the spongy Bones. It is worth Observation to take Notice, that the Smell would not be maintain'd by the Inspiration and Expiration of the Air only, which would render the Parts too dry, without a continued Flux of this Humour, which preserves the Passages moist, and so the Impressions are render'd agreeable to the smelling Organs by the Air, which may affect the Nerves in a due Manner. From hence it appears, there is such an Expansion of the Pituite Membrane in a little Space ; for it invests all the foresaid *Sinus's* and spongy Cells of the Bones, that the Particles of Odours convey'd thro' the Air may touch them in a larger Superficies. And this is the Reason that the Scent of Things remain with us sometimes after the Subject is remov'd, when some small Particles of the Odours get in among the Interstices or Chinks of the Cells. Hence it is, that some Animals who have larger Cells have their

Smell more perfect and lasting, as is evident in Dogs.

The lower spongy Bones of the Nose, which by the *Moderns* are said to be the *Apo-physes* of the *Maxillaries*, Mr. *Raw* has determined to be a single Pair of Bones of the Upper Jaw ; for the Nostrils in grown Persons may be separated by a skilful Hand from the Bone of the *Ethmoide Process*, or that Sieve-like Bone in the inner Part of the Nose full of little Holes, to receive the ferous and pituitous Humours from the soft pappy Processes of the Brain ; and those Bones in the Nostrils are so easily divided, and fall of their own accord, that in several Scul's in Church-yards and Charnel-houses they are wanting.

You will find a great Disagreement among Anatomists about the *Foramina* or Holes that occur for the Transimission of the Nerves in the Skull. The best Method that appears to me is that of my Master *Raw*, who in his *Osteology* does not, as others make them, reckon the *Foramina* of the Skull peculiar or singular to each Bone ; but after his Description of all the Bones of the Head, he proceeds so, that he takes Notice of every particular Bone according to its natural *Compages* or *Construction* ; for the *Foramina* are compos'd sometimes of many Bones together, from whence they have vainly imagined to divide them into singular or distinct Bones. He reckons Ten internal *Foramina* of the Skull, beginning from those which are form'd for the Olfactory Nerves. By the Second *Foramen* passes the best or choicest Pair of Nerves. The Third *Foramen*, which is an unequal one, serves for four Pair, viz. the Mover of the Eyes, the Pathetick Pair, the Passions ; the first Ophthalmick Branch of the fifth Pair ; the sixth Pair of Nerves for governing the Muscles of the Eyes, which others call *Timidum*. The Fourth *Foramen* transmits the second Branch of the sixth Pair that runs to the Upper Jaw. The Fifth *Foramen* from the third Branch of the fifth Pair serves the Lower Jaw. By the Sixth *Foramen* enters a Branch of the Artery springing from the external Carotide Trunk. The Seventh *Foramen* admits the internal Carotide. By the Eighth *Foramen* enters the seventh Pair of Nerves, call'd the *Auditory*.
The

The Ninth is form'd for the Reception of the eighth Pair of Nerves, call'd the *Vagus*. The Tenth, which is often double with the ninth Pair, is call'd *Linguale*, or the Pair of Nerves belonging to the Tongue. To these belong the greatest *Foramen* of the Skull, by which the *Medulla Oblongata*, the tenth Pair likewise, the Arteries of the *Vertebra*, and *Willis's* Spinal Nerves, all issue forth. You may see what a Distribution of Nerves *Mr. Raw* makes. He reckons *Willis's* Pairs of Nerves not to be ten, but barely nine; because the last Pair, which *Willis* calls his Tenth, rather has Relation to the Neck; and therefore rightly calls that Pair the first Pair of Nerves of the Neck, because he has observ'd them to proceed from the first and second *Vertebra* of the Neck.

Of the Eleventh Pair of Nerves of the Brain, which *Mr. Bidloo* reckons with the other Nerves of the Brain, and with the utmost Injustice to *Galen*, attributes the Invention to himself; *Mr. Raw* is of this Opinion, that it is true that the said Nerve proceeds out of the Bones of the Skull, as has been very well known, but that it comes out of one and the same *Foramen* with the eighth Pair, leaving the same in the Muscle call'd the *Trapezium*, resembling a Monk's Cowl: But because this Nerve is not of the Substance of the Brain, for as much as it is contain'd in the Bones of the Skull, it proceeds from the Spinal Marrow, arising betwixt the second and third *Vertebra*, and absurdly referr'd by *Bidloo* to the Nerves of the Skull, but rightly call'd by *Galen* formerly the Nerve on the Side of the *Medulla Oblongata*. Thus much of the Head. I shall now say something of the Limbs, which *Mr. Raw* communicated to us: And first of the *Carpus* or *Wrist*, with its due Disposition as it appears in the *Skeleton*. The most remarkable Articulation of this, and the Union appears so difficult, that those Anatomists who understand the Osteology in the *Skeleton*, observe this Part presently, which if it is not dispos'd in due Order and Form, the Dexterity and solid Knowledge of the Anatomical Artificer is soon discover'd, more than in the Whiteness of the Bones, and other Trifles esteem'd by the Ignorant. Therefore he shew'd us how to dispose the Bones of the *Carpus* after this Manner: The *Carpus*

or *Wrist* has eight Bones, whose Position by reason of their Irregularity we cannot describe; but they make a double Joint or Articulation, one with the *Radius* and *Ulna*, the other among themselves, which is made thus: The fourth little Bone of the first Order scarce makes any Thing to the Articulation; but the superior only adheres to the little interior Bone of the three small Bones of the first Order, and receives the Tendon of the Muscle of the internal Bender of the Wrist. These three little Bones of the upper Part or first Order, join'd by a close *Diarrhosis*, forms the superior Head, which is articulated for the most part with the *Radius* and *Ulna*, making below a Cavity, which receives the form'd Head from the two little Bones of the second Order; so that you may see there is a double Order of these Bones; for the first Order has four little Bones, the second as many, and there is a double Articulation, one with the *Radius* and *Ulna*, the other with the three little Bones of the first Order. Besides, the Order is to be so dispos'd of these little Bones below, that you may leave a deep Cavity for the commodious Passage of the bending Tendons of the Fingers, Nerves and Arteries which belong to the inward Part of the Hand.

The Famous *Mr. Raw* observ'd something to us of great Curiosity as well as Use concerning the Generation of the Teeth. *Kirkringius* some time ago put forth a Piece of the Generation of the Bones of a *Fetus*, writ with wonderful Diligence and Accuracy of Judgment; but that which is strange, there is nothing to be met with concerning the Teeth or their Generation. Our Anatomist discours'd of this Thing to us with singular Perspicuity and Care, after this Manner: He said, it was admirable that the Seeds of all the Teeth should lie hid in the Sockets of the Gums or Jaws, and that as many Seeds as lay there latent, so many Teeth a Man should have in his Life; and that he could demonstrate to the Eye these Seeds that were hid in the Gums of a new born Child: That every *Fetus* contains the Seeds of the compleat Number of Teeth which he is to have, and which are Fifty two; for besides Thirty two Teeth which every perfect Man has, there are the Footsteps or Tracks of twice

Twenty more to be found in every Infant : For Nature has so appointed, that there should be 8. Cutters, 4 Dog Teeth, and 8 Grinders, which fall or drop out about the 6th, 7th, or 10th Year of Age, to be restored by those that lie hid in the Gums, and are to supply their Places. There is a Necessity for the first to fall out, because the Substance of the next are to be harder and more compact than that of the Jaws. What is further remarkable as to the Structure of the Teeth, is, that the internal Cavity of the Teeth, compared with the Membrane that invests the external Root, is much the same as the internal and external *Periosteum* of the Bones. And this Mr. *Raw* demonstrated to us in cutting a Tooth lengthways that was fill'd with Wax, which Filling of the Vessels might likewise be done without Wax from the Blood it self (for Example sake) if the Jugular Veins of a Dog were bound.

In *Myology*, or a Description of the Muscles, Mr. *Raw*'s Observation is very well worth our Notice concerning the extending Muscles of the Neck, Back and *Lumbares* : For when most Anatomists call the Extenders of the Neck two, *Transverse* and *Spinal* ; those of the Back and *Lumbares* three, with various Names, the *Sacrum* or *Sacro-lumbarem*, the *Longissimum Dorsii*, and *Semispinosum* ; Mr. *Raw* only admits of one Pair of Muscles, which extends the Neck, Back and Loins, as far as the Articulation admits of this Pair, arises partly tendinous, and partly carnosus, in its Beginning, from the posterior and superior Part of the *Os Sacrum*, and seated betwixt the Cavity which is made from the Spinal *Apophysis* of all the *Vertebrae*, and the posterior Part of the Ribs. It produces a vast Number of Tendons, which are as it were implanted in the Spinal and Transverse *Apophyses*.

All the Tendons of the Muscles of the Fingers, Hands and Feet, have a *Vagina* or Bag form'd of their own proper Substance. In these Bags are always a Liquor, which is by Nature the same with that Liquor which is collected and found in the Articulation of the Joints. Of the common Muscles of the Thigh and Leg, there are broad spread Membranes, which many have taken for the Muscle call'd the *Abducens* ; but upon accurate

Dissection, it has been found only to be a skinny Muscle, firmly binding the other Muscles subject to it. This does not properly move the Bone, because there is little or nothing inserted to it.

The Muscles of the *Pharynx* or upper Part of the Gullet, which by the most-Curious are reckon'd five Pair, are only three nicely speaking, to wit, two which dilate the Gullet, call'd *Stylopharyngei*, and one which deserves to be call'd the *Sphincter* of the Gullet, from constringing it. From this *Sphincter* the over-wise have made two Pair of Muscles, call'd the *Pterygopharyngeus* and the *Thyropharyngeus*.

In the Shoulder, the *Rotundus minor* and *Infraspinatus* make but one Muscle. It is to be observ'd in the Muscles of the *Cubitus*, that the *Longum*, *Brevem*, and *Brachiale externum*, only constitute one Muscle, which has a triple Head, but one moving Point. The *Anconaeus* is nothing else but a Thrusting out or Protrusion of the other *Extensors* of the *Cubitus*.

You'll find among few Authors any Mention made of the Muscles of the *Clitoris*, or at least a very obscure Description ; but I shall give you a more accurate Account of the same from the Dissection of a Girl of 17 Years of Age. There are two Muscles of the *Clitoris*, one on each Side, which adhere to the *Os Pubis* on the inward Side below, the Extremities of them running on both Sides with their Fibres, involv'd in two nervous Bodies, constituting or forming the *Clitoris*, which is nothing else but the End of these two Muscles ending in two nervous Bodies, the *Cuticula* or skinny Part being constantly hid by the *Nympha*, tho' it appears with many Nipples, like that of the Glands of the *Nympha*. The Use of these Muscles is to close or tie up the Vessels of the nervous Bodies, and to hinder the Return of Blood ; from whence by the Arterial Influx of Blood the little nervous Bodies swell, erecting the *Clitoris*, and tying or binding round that Membrane, so that the hanging nervous Nipples become more turgid, and thereby they nicely distinguish the smallest Titillations, and the Venereal Pleasure is increas'd. The more salacious Females, by this Contraction of the Vessels, and lascivious

vious Titillation of the Glandules, are wont to throw out a profuse Quantity of Liquor, which they commonly call Seed.

Thus much for the *Clitoris*, which upon Occasion, and by reason of the Knowledge of this Subject, some in Conversation will affirm that they know the true Signs of Virginity. But from the following Account of the Spermatick Vessels, and what relate thereto, it will appear from Mr. *Raw*, that the *Hymen* is rarely found in grown Persons, from the too great Curiosity of the Sex, and their untimely Lechery; so that it may seem a Paradox, not of little Difficulty to determine the true *Diagnosis* or Signs of an adult Person, whether she has bore a Child, or had a Miscarriage, from one that never had either. But there are several Women who have contracted Foldings or Wrinkles in the Rim of the Belly, especially lean phlegmatick Persons, upon the first Child, although you cannot come to examine strictly into the other Signs of their Virginity, who can scarce escape a just Suspicion of having had Children before by the unskilful Vulgar. Not that I shall excuse the Artifices us'd by some wanton Ladies, by which Means they swathe their Bellies, and use other proper Means after Delivery to render the Parts round and smooth; though there are other Causes than that of Conception to make the Belly furrow'd and wrinkled, which do not permit us to censure them for the Loss of Virginity: For what if the Belly should prove wrinkled upon an *Ascites*, Dropsy of the Womb, or other the like unhappy Effect? Would it not be the greatest Injury to judge they were Whores without further Inquiry? Therefore since a wrinkled Belly is not sufficient to prove their having had Children, so it is too trivial an Inquiry to assert the contrary; there ought to be other more certain *Phænomena* or Appearances to induce us to pass a clear Judgment upon the Matter. These Things are to be found, partly from external Causes, and partly from the internal Parts of the Women: And in the External, we must inquire into the Part call'd by the *Greek* Anatomists *Σχημα μωρου*, the great Fissure or Chink, by the Inspection of which a more certain Judgment may be made of the having had Children: For the Aperture of this, which by

Anatomists are call'd the Lips, that Part which lies towards the *Anus* is more strict, and sticks closer together, in those who have not yet known a Man; so that the Space betwixt the Lips and the *Anus*, call'd the *Perinaem*, is broader and larger, but the Fissure it self, especially towards the Gut, straiter and more united. This Strictness of the Bridle of the Lips, by the Passage of the *Fætus* in Child-bearing, is considerably relax'd, and the Fissure it self for that Reason towards the *Anus* not a little dilated; neither will it afterwards return to its pristine Texture again.

As to the internal Parts; we ought to examine the Foldings of the Orifice of the *Vagina* or Neck of the Womb, call'd by some the *Caruncula Myrtiformes* or Myrtle-berried Caruncles, which by a great many are believ'd to be the Remains of the *Hymen* after deflouring. These make the said Orifice of the *Vagina* straiter by their wrinkled Foldings, and by their turgid and uneven Swelling, so that in these wicked Days, they are by most People taken for the *Hymen* or Virginity it self: Neither is it to be imagined, that in those Girls who now and then use a Man, the Virgin Pleasure is altogether wanting; for if they are healthful, and of a good Constitution, not too phlegmatick and spongy, the Closeness of the Orifice, and the Swelling of the Caruncles, will be maintain'd sufficiently entire; to take no Notice of the Arts us'd to constringe the Parts, and render the Passages straiter, by the warm lascivious Nymphs, who make it their Study to attract Men to their Venereal Embraces. But the Matter will be quite otherwise in those who have had but one Child; for in these the Unevenness and Wrinkles of the glandulous and membranous Parts, those grateful Inducements to Venerary, are so obliterated or worn smooth, that there are scarce any Remains left of their having been otherwise; which has also been the Reason that those Foldings or Wrinkles have been taken for Caruncles or fleshy Swellings, which *De Graef*, that curious Inquirer into the Organs of the Fair Sex, will not allow of by any Means.

So much for the Signs of Child-bearing, which ought not to be esteem'd a superfluous Speculation, because they have been found so difficult

difficult at all times, as well as those of Virginity; as is attested by the Learned *Horace Eugene*, formerly Chief Physician to the Duke of *Savoy*, who says, in his first Epistle, Tome 2d, Chapter 5th, in the *Folio* Edition, printed at *Francfort* 1597. *Sex probata Fama & Peritia Obstetrices Juvenulam quandam judicasse Virginem intactam, quæ septem antea Mensibus Puerum pepererat.* Six Midwives of approv'd Skill and Reputation, adjudged a young Girl to be a pure Virgin untouch'd by Man, that had brought forth a Boy seven Months before.

Our Anatomist speaking concerning the Circle about the Nipple in the Breast, says, it is made up of the finer Part of the *Cutis*, but has a firmer and more compact Texture than any other Part of the Skin, lest the continued Force of the Infant beating against the Circle in sucking, should easily hurt it; for we may see in other Parts of the Body, if we suck the Skin, it will instantly grow red. From the Description of the Glands, you have as follows.

There are eight greater Glands which are found in a Humane Head, the two *Parotides*, two under the Jaws, two under the Tongue, and those call'd the Almond Glands; all which are compos'd of a large Number of other Glands, whose distinct Orifices we may easily see with our Eyes. The *Parotides* empty their *Lympha* by *Steno's* Duct into the Jaws, perforating the Trumpet Muscle, which is round upon the Cheeks like a Circle, near the third Grinding Tooth, from the Dog Teeth of the Upper Jaw-bone.

The Glands under the Jaws, and those under the Tongue, which *Placentinus* described long before *Wharton*, empty their *Lympha* by one and the same Duct under the Tongue, near the Bridle and Frog Veins. *Nuck* has a new Gland under the Lower Eyelid, which he assigns for carrying of a watry Humour in the Eyes, which being suppos'd to rise from the Brain, is all Fiction and *Chimera*.

During the Time we continued our Anatomical Exercises, a Controversy was maintain'd betwixt Dr. *Phil. Verheyen* of *Louvain*, and Dr. *Godfrey Bidloo* of *Leyden*, both Anatomists of their several Universities, concerning the Gland *Thymus*, which is seated in the Throat, for separating the *Lympha* from the Blood, and emptying it by the

Lymphatick Vessels. The Arguments of this Dispute, and the Writings upon them, on each Side were publickly printed. From this Controversy, rises an Occasion for us to examine this Gland more nicely, together with its Situation in a new born Child: And we found it sticking under the Throat, as well in the superior and anterior Cavity of the Breast, under the *Os Sternum*, it joins to the *Mediastinum* (which divides the Lungs and other *Viscera* of the *Thorax* into two Parts) by Means of a fine fatty Membrane, which may be compared to that of the *Caul*. It touches the *Vena Cava* in its superior Trunk, the whole *Aorta*, before it winds it self into an Angle, and Part of the Beginning of the *Pulmonary Artery*, as far as it is visible out of the *Pericardium*. It touches lightly upon these Vessels by the Intervention of the foresaid Membrane, so that you may reach it with your Fingers. And particularly it is to be observ'd, contrary to that jejune Description of Mr. *Bidloo*, concerning the Situation of the *Thymus*, that the upper Part of it touches the first Division of the superior Trunk of the *Vena Cava*, but not one of the three Branches from the Angle of the *Aorta*; but the lower Part of this Gland is found upon the *Pericardium*, even to the Middle of the Heart, and adheres to the *Pericardium* by Means of the foresaid loose Membrane. The particular Use of this Gland is, without all doubt, for Assistance to the larger Vessels: But when it swells in Infants and the *Fœtus* with a milky chylous Juice, which, after the *Fœtus* is born, sensibly diminishes, it must appear altogether to be design'd for the Nutrition of the *Fœtus* in the Womb; but for what Reason we do not yet know.

Mr. *Raw* first observ'd in his *Angiology*, or Description of the Vessels, that the great *Liemerick Branch* of the *Vena Porta*, where the *Pancreas* joins to it, sends forth seven, eight, and sometimes ten or more Branches, according to the Length of the Duct; the Veins having inwardly membranous Productions, call'd *Valves*, two whereof always correspond as to Height and Situation; not having that Use as many Authors would have them, to further the Motion of the Blood in the Veins; for this the very Laws of Circulation can effect, altho' the

Veins be far distant from the Heart, and scarce feel its Impulse. For another Reason also, we shall not assign *Valves* peculiar to all the Veins, but to the *Cava* only and its Branchings, that in every *Systole* of the Heart the Venal Blood might at that Moment be stop'd, lest too great a Weight might hinder the Admission or Entrance of the Arterial Blood into the Veins. Besides, -we see in the lower Parts the *Valves* always apposite to the Orifice of the Branching Veins, that so the Blood entring by those Orifices, and the larger Ducts of the Veins, might be received as it were by so many divided Channels, lest the protruded Blood break, and interrupt the light Motion of the Vital Stream in the larger Veins on both Sides. But it is to be observ'd still, in the great lower Branch of the *Cava*, and the superior Trunk before it makes two, that there are scarce any *Valves* to be found : But if there are any fine subtle Membranes produced in these larger Trunks next to the Heart, they are seldom able to resist the impetuous Motion of the Blood from the *Systole* of the Heart ; for which Reason they are rather found in those Vessels wherein the *Impetus* or Force is sensibly remitted. On the contrary, the *Vena Porta* ought to have no *Valves*, by reason that Pressure in the *Systole* of the Heart cannot be exercis'd in the Blood of the *Porta* ; for the upper Part of the *Porta* does the Duty of an Artery, by receiving the Blood into its inward Part, and distributing it through the Liver. Hence it has rather the Texture and Make of an Artery than a Vein.

What I have observ'd in the opening of dead Bodies, as to the Situation of the Parts in general, and their Connexion, I shall communicate to you in short. Upon the cutting open the Belly, as it is known, the Guts appear first in View, which are so dispos'd in their natural Situation, that the *Fecunum* or hungry Gut fills the Region above the Navel, but the *Ileum* that below the Navel ; so that these took up the greatest Part of the Cavity of the *Pelvis* or Bottom of the Belly. The *Colon* lay hid in the lower Part, and in a crooked *Sigmoide* Figure from the right Hollow of the *Ileum*, just to the *Intestinum rectum* or strait Gut. The *Duodenum* lay buried in the left Side under the *Fecunum*.

The Liver occupied the whole Breadth of the upper Part of the *Abdomen* under the *Diaphragm*, so that a much greater Part lay on the right Side than on the left, because there must be some Room left for the *Spleen* ; but the *Stomach* seems to be almost entirely hid under the *Liver*, and is fasten'd to the *Spleen*, by the *Vas Breve*. Over these the *Omentum* or *Caul* extends it self, which is not perforate any where, but adheres to the *Colon* with two Folds, and is fasten'd otherwise singly to the *Stomach*, the *Spleen*, and the *Duodenum*. The *Urinary Bladder* to the Inside is only united by Fat, but on the other Side lies in the *Hypogastria* or lower Cavity, that the Stone might be cut from thence with less Trouble and Difficulty ; but because of the Fat, the Bladder wounded in these Parts can never knit or heal again with the *Peritonaeum*, but the Urine must fall into the Cavity of the *Abdomen* with deadly Danger. The *Intestinum Rectum*, particularly its *Sphincter*, appears to be entirely buried in Fat, which is not only of extraordinary Use in expelling the hard *Feces*, but is eminently serviceable in a difficult Labour, to wit, that it might yield or give Way to the Birth, which can scarce be done, if the carnous Fibres of the Muscles of the Neck of the Womb lie adjacent or next to them. On the other Hand, this Fat in a preternatural State contributes much to the Generation of *Fistula's* in the *Anus*.

In opening the *Thorax* or *Chest*, the first Thing that comes in View is the *Mediastinum* or Partition, which is nothing else but a Doubling or Continuation of the Membrane of the *Pleura*, and make two Bags on both Sides ; from whence it is plain, from what Reason a particular Dropsy may attend this Part, which *Hippocrates* takes Notice of. The eighth Pair of Nerves or *Par Vagum* is dilated through the Neck into the Breast, and being held up by the Parts adjacent, falls into the *Pericardium*, *Lungs*, &c. but the *Intercostal Branch* is presently fix'd to the *Vertebra* of the Back.

In the anatomizing of a young Man of about 16 Years of Age, Mr. *Raw* demonstrated the following Things to us ; viz. the *Seminal Vesicles*, the *Vasa Deferentia*, and the Veins of the Testicles. The *Seminal Vesicles* are firmly united to the *Urinary Bladder*

about the *Sphincter*, and the *Sphincter* seems to contribute to the Excretion of the Seed in Coition, altho' those Vesicles have musculous and carnous Fibres, which first of all irritate them.

The *Vasa Deferentia*, as to the outward Appearance of their *Vesicles*, are placed among the *Ureters*, which are express'd by the Figure X. contrary to the Anatomical Observations of *Lealis* in the Works of the Learned, printed at *Leipsick* in the Year 1687, pag. 229. where he takes Notice, that the *Vasa Deferentia* terminate not in one common Duct, but in two plainly distinct ones close united with each other, adjoining to the *Urethra*, which he demonstrated to the Eye by blowing them up with a Pipe. The same Author has ill describ'd the *Vasa Deferentia* where they are so dispos'd as to form the *Epididymis* of the Stones, which are winding Vessels, that may be easily separated with the Fingers; but on the other Hand, by the frequent occurring of the *Anastomosis*, we may see them in the prepared Vessels when fill'd with Wax.

Those who deny the returning Veins from the Testicles are foolish; for by Injection with red Wax, they may be demonstrated to the Eye in a sufficient Quantity and Number; from which Experiment, we may clearly discern the Veins which are for the Nutrition of the *Vasa Deferentia*. The Substance of the Stones is compos'd of meer Capillary Vessels, which Vessels are sustain'd by the Membranes from the *Albuginea*, or that Skin which immediately contains the Testicle; as for Example, we see the *Pia Mater* made in the Brain; for those Extremities of the Capillary Vessels are not only from Veins and Arteries, but likewise from the *Vasa Deferentia*. These Vessels are upheld by the Form of the *Albuginea*, lest they should be squeez'd or disturb'd, and so the Separation of the Seed is made.

If one Testicle only appears in a Man, the other oftentimes is hid in the *Abdomen* or *Belly*, and by some unskilful Surgeons sometimes is taken for a *Bubonocle* or Rupture when the Intestines fall into the *Groin*. The internal Membrane of the *Urethra* is the Production of the internal Membrane of the tendinous Part of the Bladder, and so the Reins have a *Gland* instead of a Skin.

Hence comes the greatest Pain after cutting for the Stone, by Means of the Consent of the *Glands* of the Yard.

Mr. *Raw* compares the *Vasa Deferentia* and *Seminal Vesicles* with the *Hepatick Duct* and *Gall Bladder*; for as we see all the superabounding Bile or Gall excern'd out of the *Hepatick Duct* return'd into the *Gall Bladder*, so in like Manner all the Seed that is brought from the *Vasa Deferentia* regurgitates or flows back into the *Vesicles*, and then at last from those two *Vesicles* by their distinct Canals is cast into the *Urethra* in the Act of Venereal Coition.

Among the Preparations of Women's Organs, he observ'd to us the following Particulars concerning the *Sinus* of Women observ'd by the Ancients. The Knowledge of this *Sinus*, (which is observ'd after the Caruncles call'd the *Myrtiformes*, and in the Neck of the Womb under the *Os Pubis*, and in those who have only bore one Child will easily admit of ones Fist) is of great Use in the Delivery of the Birth; for then the Hand of the Surgeon or Midwife, except applied betwixt the prominent Parts of the Infant, and this *Sinus* which is under the *Os Pubis*, is of no Use; for the Space here affords sufficient Room for the turning of the Hand, giving Way in the mean time for the Parts of the *Fetus* pressing to the Birth upon the *Os Coccyx* or Rump-bone.

After a difficult Delivery, and the Use of the Hook to draw away the Child, a deadly *Hemorrhage* or Flux of Blood often succeeds; and indeed from this Cause, because the *After-birth* being separated from the dead Child, the Womb, by reason of the Substance of the *After-birth* remaining behind, cannot close its Orifice as it ought to do; for by such Construction, otherwise these Mouths of those Vessels which discharge Blood would be shut up.

The First of *March*, I, who am the Author of this Relation, and one Mr. *Wickham*, an *Englishman*, made an Experiment of the Aperture or *Hiatus* of the *Tympanum* or Drum of the Ear, which was invented by *Rivinus*, Professor at *Leipsick*, by emitting Quicksilver thro' *Enstachius's* Tube, which immediately flow'd by the Drum of the Ear out at the Auditory Passage; but the Place where it particularly issued out we could not distinguish.

guish. Mr. Raw, who was present at the Experiment, thought that the *Mercury* work'd it self thro' the Pores of the Membrane by Means of its Weight, as we may see it do thro' Leather, &c. and he told us, he had seen such a Percolation of *Mercury*, thro' the Membranes of the Urinary Bladder it self. This Experiment of ours was made upon the dead Body of a young Fellow of about Sixteen Years of Age.

The following Chirurgical Operations I saw perform'd upon live Subjects at *Amsterdam*, partly, by the never too much to be commended and celebrated Surgeon Mr. Raw, partly by Mr. *Peter Adrianfen* and Mr. *Boecklemann* eminent Surgeons of the same Place.

The Twenty first of *January* 1707. there came a Boy to Mr. Raw, from a Village call'd *Cromenic*, of about Sixteen Years old, with an Incontinence of Urine, and labouring under grievous Pains in the *Hypogastrick Region*; these were Signs of a Stone, of which, that our Master might be sure, he examined him after the following Manner: Laying the Boy upon the Ground on his Back, he supported his *Yard* upright with soft Rags, and thrust his crooked *Catheter* which he us'd for that Purpose into his *Urethra*, first moistening it with Oil; but he put the crooked Part of the *Catheter*, first up towards the *Perinaum* or *Anus*, just till he came to the *Os Pubis*, which then he turn'd upwards, and then penetrated into the Bladder. He then gave us sufficient Knowledge how to manage the *Catheter*, and discover whether there was a Stone; which we sensibly understood from the Motion of the *Catheter*, that in this Subject there was a Stone sufficiently large to cut; and accordingly he determin'd to make a Section the *March* following, because he was willing to have the Cold of the Winter past; but in the Interim, he advis'd the Patient to drink warm Milk constantly, instead of his ordinary Drink. The Cause why this young Fellow could not hold his Water, was from the Size of the Stone continually pressing on the Neck of his Bladder, so that the Contraction of the Bladder never ceased, and consequently a voluntary Emission must follow. I was not willing to pass by this Examination of the Stone, knowing it is not a little Commendable for a

Surgeon to be dextrous in Searching for and discovering the Stone, neither are all so delicate in the Management of their *Catheter*.

The Seventeenth Day of *February*, 1707. I, and Mr. *Wickham* aforesaid, went with our Master Raw to *Cromenic*, a Village near *Harlem*, where the Boy was to be cut; which was done in the Presence of Two Surgeons and Burghers of the said Town. After the Body was dispos'd in a proper Posture with the Arms bound, and the *Posterior*s laid higher than the Head, and the Feet so tied, that the Part to be cut could not be moved: Mr. Raw kneeling with one Knee upon the Table, sets himself directly before the Patient, thrusting in a common *Catheter* moisten'd with Oil into the *Yard*, at last meeting with the Stone, he withdraws that and puts in another *Catheter*, so deep that he might feel it upon the *Perinaum* with his Fingers, then he makes an Incision in the Left-side of the *Perinaum*, Four Fingers breadth from the Tuberosity of the *Os Ischium* or Huckle Bone, and a Fingers breadth from the *Anus*, which Place of Incision the *Catheter* depresses towards the *Perinaum*. His Incision-Knife was guarded a Thumbs breadth, looking like a common Launcet, which was not laid above the Length of the first Joint of the Finger. First, He cut the Skin, and then making an Incision thro' the Fat and the Muscles, he applied his Itinerary; after which he penetrated the Neck of the Bladder, then putting in the Pen-knife to the Wound, holding it strongly with his Hand, he deliver'd it to me, but in the mean Time snatch'd up his *Forceps* and drawing out his Pen-knife, he thrust it in betwixt the Itinerary and Conductor, dilating the Lips of the Wound by those Two said Instruments, by which Means he happily drew out the Stone; when it was extracted, it was the Size of a little Hens Egg, moisten'd with Blood, and on one Side surrounded with a small little Membrane, where perhaps it had an Adhesion to the Side of the Bladder: It was almost of a round Figure, and uneven like a large Sand or gritty Stone. Cleansing the Wound with a Sponge, he applied nothing but a little Lint, and so binding up the Patient he put him to Bed, placing under his Buttocks some Oatmeal to receive the Urine,

that wou'd run from the Wound and Fæces upon Occasion. He order'd the Curtains of the Bed to be drawn close, that the Light might not disturb the Patient's Rest, to compose whom, he order'd an Anodine Emulsion to be drunk, *ad libitum*. After the Operation, and the Sick being just laid on the Bed, he cried out of exquisite Pains in the *Glans* of the Yard, when the Stone was taken away, which happens by Consent; in all which the Membrane of the *Urethra* has with the inward Membrane of the Bladder.

On the Seventh of *March*, I saw another *Lithotomy* or Operation for the Stone perform'd by my Master on a *Jewish* Boy of Seven Years old, in which, beside what I have already told you, nothing particular happen'd, except the falling down of the *Intestinum Rectum*, occasion'd by the Cries of the Patient, which lubricating with Oil, he put up again with his Finger, lest it shou'd hinder him in his Operation.

The 21st of *Febr.* A Boy of Eight Years old labouring under an *Hydrocele* was brought to Mr. *Raw*, who making a Perforation by an Instrument call'd a *Trocar* into the *Scrotum*, freed him in half an Hour's Time by letting out the Water. In this Operation these Things are to be observ'd: 1st. That we touch not the Veins in this Perforation. 2^{ly}. That the Needle or Point of the Instrument be applied to the Transparent Place, and that you pierce no deeper than you find it clear. 3^{ly}. After the Operation is over, that you apply a Plaster of *Cummin*, or the like, over the whole Cod. Also it is to be noted, that in an *Hydrocele*, the *Vasa Preparantia* and *Deferentia* may be distinguish'd by the Fingers: In the *Hernia* the contrary, for they seem to be confus'd by the falling of the Guts. Which may serve for a Diagnostick Sign, whereby to know the present Condition of any Patient.

The 22d of *Febr.* Mr. *Raw* visited a Mechanick, who knew nicely how to make the best Anatomical and Chirurgical Instruments. He labour'd under a *Caries* of the Shin-bone in the upper Part, in which Place Mr. *Raw* made an Incision, and directed his Knife to the very Bone; having made the Incision, he separated the proud Luxuriant Flesh from the

Lips of the Wound, which he dilated, that there might be more Room for applying the Cautery. The Bone being infected with the *Caries*, the carnous Fibres of the Muscles were eat away in the carious Part, and cou'd never be brought upon the Bone again, till the *Caries* was taken away. At last the Cauteries were applied, that the Vessels which supplied the *Caries* upon the Bone might be extirpated, which being done, the carious Part separated for a Time, and at last healed; for the *Carious* Part of the Bone being taken away, the carnous Fibres happily grew again, and at length consolidated with the Bone.

There was an Infant of Six Months old, whose Face was deform'd with a double Hair-Lip; which the Manual Operator separated with his Knife from the Gums of the upper Jaw-bone, to which they were tied: This being done, there were Three Silver Needles prepared, one Three-corner'd, another Round, and a Third Broad of Three Fingers Length; with the First, they sew up the gaping Fissure of the Lip; the second Needle is put thro' the lower Part of the Fissure, binding close the Lips of the Wound as the former does; but the Third Needle is applied in the middle Part of the Fissure. These being accurately us'd to the Part by help of the *Forceps*, in the last Place, a Plaster is to be put upon the Two Extremities of the wounded Part: And after the Operation, a comfortable Draught is to be given to the Infant.

Amputation of Members.

IN the Amputation of the Foot, the Extremity of it ought to be plac'd higher than the upper Part, that it may hinder the Blood from rushing too forcibly on the Part cut: Then it may be stop'd by Application of the Chirurgical Instrument call'd the *Taarniquet*, so that a Spoonful of Blood shall not be lost. The *Amputation* being perform'd in a fleshy Part, is sooner done than in a Bony, where the Saw is forc'd to be us'd, otherwise the Bone might be much easier broken. When the Work is over, you must not bind the Part up with Oils or Plaisters, nor tie up the Arteries by the *Forceps*, but 'tis sufficient to apply Astringent

gent Powders with a Bladder, and fenc'd with Plaisters. But take Care you use no *Viriolick Astringents*: Neither make your Ligature too strong in Children and lean People, for fear of a Gangrene, but in grosser Bodies it may be stricter made.

Such Excrefcencies are the best taken off by a Ligature, which is done with a strong Piece of Silk, wrap'd Two or Three Times round the Excrefcence, and tied hard with a Piece of Lead or Iron at the End of it; so it will fall off in Three or Four Days: The light Inflammation that may arise from the Ligature, is not to be regarded. This Operation was done by Mr. Boecklemann, the 16th of Dec. 1706. in a Woman of Eighty Years of Age with extraordinary Succels.

Mr. Bidloo of Leyden was call'd to a Woman at *Amsterdam*, labouring under a *Scirrhus* of her right Breast: But his Opinion was, that this *Scirrhus* was a *Cancer*, and therefore prepar'd to cut it off; but Mr. *Ruyfch* being call'd to Consult with him before the Operation, affirm'd it was no *Cancer*, but only a *Scirrhus*, and applying a Plaister of *Cummin* to it, in Four Days dispers'd the Tumour, and made a happy Cure of it. In a true *Cancer* the Matter either lies hid, or is exulcerated, and Mr. *Ruyfch* thinks it the best Method not to irritate it, much less apply hot discussing Medicaments to excite the Acrimony: The

safest Medicines are the cooling, as the Em-plaister of Frogs with *Mercury*, or Plates of Lead dipt in *Quick-silver*.

Before all Things, the falling down of the Guts are to be restor'd or put up with the Fingers, or a certain obtuse round Instrument, they may be thrust up by Error betwixt the *Peritoneum* and the Muscles of the *Abdomen*, which often happens; for the *Peritoneum* is much easier divided from the Muscles of the Belly in live Persons, than in dead Bodies: So that if the Guts, as said before, be thrust betwixt the Muscles and *Peritoneum* it is Mortal, for a Gangrene presently follows: The same Thing happens when the Guts being down, are too much handled and squeez'd.

These Bones are restor'd by Means of an Iron or Wood Instrument, form'd so that it can answer to the Inside of the Nose: This being cautiously put up by Degrees into the Nostrils, raises up the depress'd Bones: Outwardly it ought to be assisted by the Hand, till what is wanting be perfectly restored. This being done, one or two little Pipes, as Necessity requires, ought to be put up the Nostrils, which Pipes should be made with Two Auricles perforated, thro' whose Holes a String being put, might be tied above. Outwardly apply a Defensative Plaister of *Vigo*, which may be tied to the Part by the Neck.

Of the Manner and Laws of Secretion, the true Structure of the Glands, and of the Operation of Vomitive, Purgative and Mercurial Medicines, which are Mechanically explain'd. By Dr. Chene.

1. **T**HAT the whole Body is nothing but a Congeries of Canals, the greatest (at least a considerable) Part of which is Glands properly so called, design'd for the Separation of some Fluid.

This is evident, when any Part of the Body is swell'd, so that the Inconspicuous

ones become visible; and has been clearly demonstrated by *Malpighius*, *Leuwenhoeck* and others.

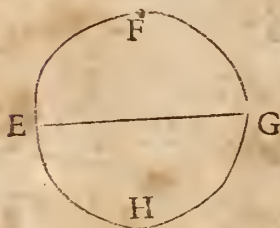
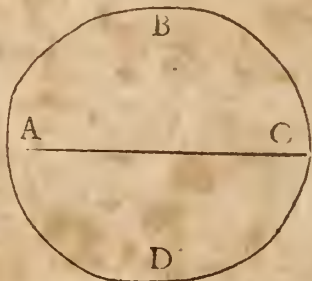
2. That when a Machine is disorder'd, if we should see it righted by adjusting such a particular Part, we might without Scruple affirm, that it was some Injury done to that Part, [which had disorder'd the Machine; especially,

especially, if after the Whole was taken to Pieces, we should find them all sound, save that particular One.

Thus, if we should see a Watch-maker, by adjusting only the Balance of a Watch, make her go right; we might say, the Distortion of the Ax thereof had occasion'd her going wrong, especially if all the other Parts be found as they should be.

LEMMA I.

LET there be a greater Distractile Cylindrical Canal, whose Orifice is $A B C D$, through which a given Quantity of Liquor passes in a given Time; and a lesser One $E F G H$, through which a proportional



Quantity of the same Liquor passes with the same Celerity as in the former: Let now the greater $A B C D$ be encreas'd or diminish'd by the lesser $E F G H$, so as that in the encreased or diminished Cylindrical Canals the same Quantities only pass, which pass'd in the same Time in the first sup-

posed Canal $A B C D$: To find the Quantity of the same Fluid, which will distract, (and produce the other Effects of encreasing the Quantity of the passing Fluid, and consequently its Celerity,) the Canal, (by encreasing its Diameter) first suppos'd $A B C D$ after the same Manner, only that the encreas'd ($A B C D + E F G H$) or diminish'd ($A B C D - E F G H$) Canals are now distracted.

Let the Quantity, which in the first Supposition passes through the Canal $A B C D$ be call'd a , and the Quantity which passes through the Canal $E F G H$ be call'd b : Since in the first Supposition the Celerities are the same in both, their Orifices will be as a and b respectively. Likewise the encreas'd and diminish'd Canals (seeing their Altitude is suppos'd the same) will be as their Orifices $a + b$, and $a - b$; and the Quantities passing through them in the same Time, with the same Celerity, would be likewise as $a + b$ and $a - b$: But (in the second Supposition) the same Quantity is suppos'd to pass in the encreas'd Canal ($a + b$) and diminish'd one ($a - b$) which pass'd in the first suppos'd Canal $A B C D$, or a , therefore now the Quantities passing through the Canals, encreased or diminished, will be as a ; wherefore, as $a \pm b$, (the Quantity passing through the encreas'd or diminish'd Canals in the first Supposition) is to a ; (the Quantity passing through them in the second Supposition) so is b (the Quantity passing through the lesser Canal $E F G H$, in the first Supposition) to

$\frac{a b}{a \pm b}$, the Proportional Quantity which passes through, and will distract the lesser Canal $E F G H$, after the same Manner that the encreas'd or diminish'd Canals are distracted in the second Position. Adding or Subtracting this Quantity from a , (which, as the Quantity passing through, or distracting the encreas'd or diminish'd Canals) the Sum or Difference $a \pm \frac{a b}{a \pm b} = \frac{a^2}{a \pm b}$ will

be as the Quantity which will distract the first suppos'd Canal $A B C D$ after the same Manner, &c. $q. e. i.$

SCHOLIUM.

THE whole Canals of the Body, (save the Intestines and Lacteals) may be considered as a concave Cylinder, whose Base is the Orifice of the Aorta, as its Exit from the Heart: and whose Length is a mean Arithmetick Proportional betwixt the longest and shortest Artery, (I mean the whole Length of the Artery, till it degenerate into a Vein; for the Length of the Veins are of no Consideration here) it being their splitting into Branches which makes them not Cylindrical. Now, by *Posul. 1.* the Vessels which make up the *Glands* may have any Proportion of Minority to the whole of the Canals; supposing then an Obstruction or Dilatation of the *Glandular* Vessels, it's evident the foresaid concave Cylinder will be thereby diminish'd or encreas'd in any given Proportion: Suppose, *e. g.* the Diameter of the Cylinder so obstructed is to that of the whole, as 1 is to the $\sqrt{2}$; their Orifices will be as 1 to 2. Suppose again, there are twenty Pounds of Blood in a Man, seeing at the Beginning of the Arterial Vessels (which constitute the *Glands*) the Velocity is near the same, as proceeding from the same Cause, the Compression of the Heart: Therefore divide 20 into two Parts, which may be (in this Case) as 1 is to 2, (which done by this general Rule

$$x = \frac{m d}{m + n}, y = \frac{n d}{m + n} \text{ putting } d \text{ for the}$$

20 Pounds, *x* for the greater, and *y* for the less proportional Part, *m* to *n* their Ratio,) the Parts will be here $6\frac{2}{3}$, and $13\frac{1}{3}$, which are the proportional Parts of 20 Pounds of Blood, which would naturally pass in the obstructed Canal, and in the Remainder whereof, which is passible. But if all the 20 Pounds must now pass in the passible Canals, then it shall be distracted as much as if the whole Canals were passible; but that 30 Pounds of Blood were forced through it in the same Time, by the preceding Lemma. For in this Case, $a = 20$, $b = 6\frac{2}{3}$, $a - b = 13\frac{1}{3}$, and therefore

$\frac{a a}{a - b} = 30$. If the Orifices were as 1 to 3, then $b = 5$, $a - b = 15$, and $\frac{a a}{a - b} = 26\frac{2}{3}$, this supposing an Obstruction. If there be a Dilatation suppos'd in the same Proportions, then $\frac{a a}{a + b}$ will be in the first Case

15, in the second 16. The same may be applied to the *Liquidum Nervorum*, which passes in the Nervous Canals: For the *Gland* consists of a complicated *Nerve* as well as *Artery*, and in an Obstruction or Dilatation of the same, both *Artery* and *Nerve* are suppos'd to be obstructed or dilated.

The Design of all this is to shew, that in an Obstruction or Dilatation of the Vessels, it is the same Thing as if the Liquors therein contained were augmented or diminished in a certain Proposition: as in the Case of the Blood-vessels, supposing 20 Pounds of Blood (which is the ordinary Quantity) in a Man; and supposing one half of the whole (by an Obstruction in any Place of the said) Vessels were rendred impassable; it is the same Thing *quam proxime*, as if the whole Blood-Vessels were passible, but that one half more of Blood were forced through them in the same Time, in which the 20 Pounds passed. Of the same Nature is

LEMMA II.

THE Blood being so corrupted, that the Strength is impar'd or encreas'd, it is the same Thing as if it were in its natural Estate, but that the Quantity thereof were diminish'd or encreas'd in such a Proportion as is necessary for producing this Encrease or Decrease of Strength.

This is the 49th Prop. of *Bellini's Book De Motu Cordis, &c.* and its Converse: The Proposition it self is there demonstrated, and its Converse may be demonstrated after the same Manner exactly.

What is here said of encreasing or diminishing the Strength, is likewise true of all the necessary Effects of lessening or encreasing the Quantity of the Blood. These Things premis'd, I come to

The General Proposition.

THE General and most Effectual Cause of all Fevers is the Obstruction or Dilation of (the complicated *Nerve* and *Artery*, the *Excretory Duct* and *Conservatory*, one, or rather all these; which, as shall be afterward shewn, make up) the *Glands*, and they receive their Denomination as these, or those *Glands* are more or less obstructed or dilated.

Other Things may concur, but these are the most powerful Causes.

It were a Work of more Time and Pains than I can at present bestow, to apply this Proposition to all particular Kinds of *Fevers*, tho' I am sufficiently satisfied it will account for all. I shall here only (as an Earnest of the rest) show how to apply it to continu'd *Fevers*, and therefore contract the General into

The Particular Proposition.

THE most effectual Cause of continu'd *Fevers* is an Obstruction of the *Glands*, which will necessarily augment the Quantity of the Blood, and *Liquidum Nervorum*, in the passable Canals, and perhaps (by the Stagnation of the Fluids contain'd in these) so vitiate their Nature, as that they may be justly reckon'd to concur as a partial Cause of these *Fevers*: But I rely most on the First, to wit, the Augmentation of these Fluids. For a Demonstration of this, I shall first shew how it accounts for all the Appearances of such *Fevers*, and then subjoin several Arguments to confirm the same.

Supposing the *Glands* obstructed the Quantity of the Blood in the Arteries, and the *Liquidum Nervorum* in the Nerves may thereby be suppos'd augmented in any given Proportion of Minority to the whole Mass of these Liquors, *per Lemm. 1.* and its *Scholium*. Wherefore it will hence follow,

§. 1. That the Pulses must be stronger and more frequent than ordinary upon these Accounts; 1. Seeing there is a greater Quantity (than ordinary) of Blood in the Arteries, the lateral Pressure will be stronger; and

seeing the Arteries are distensible, they will be driven outward with greater Force, and make a stronger *Itus* upon any Thing applied to them. 2. Seeing the Quantity of the Blood is augmented, *i. e.* the Quantity of the Matter whence the *Liquidum Nervorum* is generated, there must be a greater Plenty thereof (*per poster. Part. Lemm. 2.*) generated, and consequently it will flow more plentifully and more quickly into the Heart, and make it contract oftner and more violently. 3. By the Obstruction of the Gland, the Influence of the *Liquidum Nervorum* thereinto is likewise obstructed, and therefore (*per Lemm. 1.*) there will be a greater Quantity thereof left to flow in the passable Nerves, and it must flow *qua data porta*. 4. Lastly, The Arteries on every Side running upon and touching the Medullar Substance and Fibres of the Brain, will (they being more than ordinarily distended) press them more than ordinarily, and make a more powerful and plentiful Derivation of the *Liquidum Nervorum* into the Places whither it can flow.

§. 2. From the same Cause the Inequality or Interruption of the Pulses is evident; for if the aforesaid Pressure upon the Nervous Fibres of the Brain be so strong that it either partly or totally occludes the Passage of the *Liquidum Nervorum*, there must be a Stop in the Derivation till there be such a Quantity thereof collected as shall be sufficient to over-power the *Impedimentum* occasioned by this Pressure, and so make an Inequality or Stop in the Contraction of the Heart. Moreover, when the Blood flows in such Plenty, and with such Violence from the Auricles into the Ventricles of the Heart, it may force its Way before the Ventricle be intirely contracted, and thereby cause an Irregularity in the Pulse. Add to these what may proceed from the Thickness of the Blood, (it being contracted into a less Space) and Evaporation of its Humidity, all these, either singly or compounded, will account for the Irregularities of the Pulses, which have hitherto been observed.

§. 3. Great Pains in the Head most ensue from the violent Distractions of the tender Vessels of the Brain, and from the great Pressure of the extended Arteries upon the Fibres and Membranes thereof, all the Canals of every Kind being bowld'ned with their

their respective Liquors, and that being the most sensible Place.

§. 4. A violent and burning Heat must be felt upon these Accounts; 1. Because there is a greater Quantity than ordinary running in the passable Canals, there must be a greater Motion than ordinary, and consequently a greater Heat. 2. Meerly upon the Account of the increased Quantity (without considering the thereby produced greater Velocity) there must be felt a greater Heat: For supposing the Heat in each single Particle to be the same as before, yet since the Particles are more numerous in the same Place, the Heat must be greater there too, as in Rays contracted by a *Concave Speculum*. 3. The Glands being obstructed, *i. e.* the Passages of Perspiration, the natural Heat must thereby be kept in, and consequently the whole augmented *per Lemm.* 1. Hence proceeds our unquenchable Thirst, the Humidity, (*i. e.* the thinnest Parts) being more ready to evaporate, (since now the ordinary Passages are obstructed,) the rest must be proportionally drier.

§. 5. The Difficulty and Frequency of Respiration, and the Violence of Expirations, is hence easily accounted for; the Quantity of Blood being augmented, there must a proportional greater Quantity thereof be derived into the Arteries of the Lungs, and since every one of the little Vesicles of the *Bronchi* lie betwixt Two Arteries thus inflated, it will be harder to explicate these Vesicles; and therefore one in such a State will naturally, with all his Force, endeavour to suck in the Air, which will be forced out again both by these inflated Arteries, and by the Force of the Muscles of the Breast, Diaphragm, and Lungs, which is vastly augmented both by the greater Quantity of Blood, and of the *Liquidum Nervorum*, and its more plentiful Derivation; as has been shewn in §. 1. about the Frequency and Strength of the Pulses.

§. 6. The Tongue is rough and discolour'd; because by the violent Motion of the Blood, and the Obstruction of the common Passages, the Humidity is evaporated, and the extraordinary Heat stiffens the Fibres thereof; for it's evident that only Heat and Driness discolour the Tongue. *Vide* §. 4.

§. 7. Want of Sleep must follow both;

because there is such Plenty of Blood, and consequently of the *Liquidum Nervorum*, (as is shewn in §. 1.) that there is no Need of Sleep to generate more, which is one principal Use thereof; and because of divers Disorders of the Head (accounted for in §. 3.) which will not allow that Tranquility which is necessary to bring it on, but most of all because (by the Plenty of the *Liquidum Nervorum*) all the Muscles, both involuntary and voluntary, (especially those who want Antagonists) are in continual violent Motions which must necessarily hinder Sleep.

§. 8. Ravings proceed from the Disorders in the Head, accounted for in §. 3. The Nerves being distracted by the Abundance of their Liquor, the Heat and Driness of their Parts cannot perform these Reciprocations which are necessary in sound Persons.

§. 9. The Clear and Flame-colour'd Urine proceeds from the Velocity of the Blood, which separates thereby only the thinnest of the mix'd Fluid; as shall be shewn when we come to speak about Secretion.

§. 10. The vast Increase of Strength in Persons labouring under high Fevers is evident from *Lemm.* 2.

§. 11. *Lastly*, The Ceasing and Dissolution of Fevers by Purging, Sweating, Vomiting, and Abscesses, is wonderfully accounted for from this Theory; for if they go off by the Strength of Nature, then seeing the greater Quantity and Velocity of the Blood produce a greater *Momentum* by the frequent Concussions and Force of this, the Obstructions are shatter'd and wash'd away, till the last Strokes carry away all together, and thereby go off in these or those, according as these or those Glands were most obstructed. This will be better understood when we come to speak of *Mercurial Medicines*. If by the Assistance of Medicines, then the Medicines must be such as are most proper for removing these Obstructions; as shall be afterwards shewn.

1. Thus I think I have accounted for all the Appearances of continued Fevers, which I reckon one considerable Argument for our Theory.

2. All we see done in the Dissolution or Ceasing of such Fevers is, the Opening the Glands, the driving out the stagnated Fluids

therein contained, which (*per Postul. 2.*) is another Argument. And indeed, one would hardly keep himself from thinking, if the removing these Obstructions removed the Disease, then the putting them caused it: *Quo posito ponitur, & quo sublato tollitur.*

3. All that is observable upon opening Persons cut off by Fevers, is (the rest being sound and entire) an extraordinary Swelling and Lividity in the internal Glands, particularly of the Lungs, the Liver, the Spleen, and the Mesentery; as has been observed by *Borelli* and others: *Vide Borelli de Motu Animal. Part 2. Prop. 227.* This is one ocular Demonstration of our Theory; and if the other Glands were as conspicuous, I doubt not we should see the same in them.

4. A Fourth Argument for our Theory is from what *Dr. Puccirne* has demonstrated in his Treatise of the *Cure of Fevers*: For since in Fevers the Glands are obstructed, *i. e.* the Conduits of insensible Perspiration, then by removing this Obstruction, *i. e.* by increasing the insensible Perspiration, Fevers will be more probably cured than by increasing all the sensible Evacuations; and that in the Proportion the Number of the Glands of the whole Body has to the Number of the Glands of the *Prima via*, or as the whole outward and inward Surfaces have to the Surfaces of the *Prima via proximè*.

5. A Fifth Argument is from what *Bellini* has demonstrated in his third and last Proposition in his Section, *De Febris*: He there shews, continued Fevers may arise from a Vitiation in the Quantity, Quality, or Motion, of the Blood from all or either of these. Moreover, from an Increase or Diminution of the Quantity of the Blood, there will necessarily arise an Augmentation or Diminution of its Velocity. The Motion depends upon the Quantity multiplied into the Velocity, and the Quality arises (for the most Part) from a Combination, or the necessary Effects of these. Hence, you see all that necessarily follows upon the whole Three may be accounted for from the first of these, to wit, the Increase or Diminution of the Quantity of the Blood.

6. Amputations, Wounds, Fractures, and the like, wonderfully confirm this Doctrine: For there a considerable Number of the Blood-Vessels are stopp'd, and cannot make their

Circle, and consequently increase the Quantity of Blood in the rest, so that generally Fevers ensue, if the Quantity be not lessend by letting. It is true, the violent Pain may occur, since all Pains is a *Stimulus*, and all Stimulations occasion a more plentiful Derivation of the *Liquidum Nervorum*; but if the Quantity of Blood be not suppos'd augmented, that Liquor must necessarily fail in a short Time.

7. We may see visibly in Fevers of Cold there is a violent Obstruction of the Glands of the Skin, the Mouth, Larinx, Stomach; in a Word, of all these Glands to which the cold Air is contiguous, and we can tell whence this Obstruction proceeds: Besides, this Fever may be increased to such a Degree as to differ little in its Symptoms, Violence, or Duration, from other more dangerous continued Fevers; which is a clear Demonstration of our Doctrine: For since an evident Obstruction of the Glands produce Fevers so very like the most dangerous ones, why may we not conclude, that some latent or unknown Cause may produce so general and strong an Obstruction as is able to occasion all the several most dangerous Fevers of this Kind?

8. But that which I take to be alone (without any other Proofs) a Demonstration of our Theory, is, That in all Countries betwixt the Tropicks, their continued or hot Fevers arise from a severe cold Wind suddenly blowing after excessive Gleams of Heat. This is so true, that all Travellers assign this as the Cause, having constantly observ'd their Fevers to succeed such sudden Changes of the Air. A pregnant Instance of which we have in *Phil. Trans.* for Dec. 1699. N^o. 259. in a Letter from Mr. *Hugh Jones* to Dr. *Woodroof*, concerning some Observables in *Mary-Land*. His Words are these; "The North-West Wind is very sharp in Winter, and even in the Heat of Summer it mightily cools the Air; and too often at that Time a sudden North-Western Wind strikes our Labourers into a Fever when they are not careful to provide for it, and put on their Garments while they are at work". Thus he. And indeed the genuine Account of the Matter is this: The excessive Heat must necessarily dilate the Glands to which it is contiguous, *i. e.* all the Cuta-

Cutaneous Glands, the Glands of the *Trachea*, *Bronchi*, *Oesophagus*, Stomach, and of the Intestines; and it will not only dilate them, but (by the Assistance of the natural Action of these, which is Secretion) exhale their respective Liquors, making them still flow so long as the excessive Heat continues, and as there is Blood which may supply them. Now they being thus dilated, and (by the Efflux of their Liquors) soften'd and made spongy, a sudden excessive Cold supervening must strongly contract their Orifices, and congeal their flowing Liquors, and the Greatness of their Contraction will be always in Proportion to the Violence of the former Heat and supervening Cold conjointly, as is known from the Nature of Cold. And this Contraction of their Orifices and Congelation of their Fluids will obstruct the Motion of the Blood almost up to the Heart, at least to the next Division of that Artery which constitutes this Gland, whereby both the Blood will be increased as to its Quantity, and perhaps (by this Stagnation of a Part of the same) as to the Quality thereof likewise. All which is but a Corollary of our Theory.

9. Hence we evidently see the Reason of the Frequency of our last Year's Fevers; for we were then exactly (in Proportion to our Climates) in the State of these betwixt the Tropicks. Our Summer-day Heats were more violent than had been observ'd among us in the Memory of Men, and our Nights had no Way the Heat proportionate to our Days; besides, we had often sudden Changes, which tho' not so violent as in these warmer Countries, yet had the same (tho' a slower) Effect as among them. And therefore it was that frequent Vomiting were found so useful, which (at least in such a Degree as was found then necessary) is not always so safe. The Practice was entirely conform to that of these Southern Countries, and the Necessity thereof will be understood when we come to speak of Vomiting. The same Practice obtains in Fevers occasioned by Surfeiting or Drunkenness, which is still to be suspected as a considerable Part of the Cause of Fevers in adult Persons in great Cities.

And generally, I should think either the above-mentioned sudden Changes (which may happen a Thousand other Ways diffe-

rent from the Season) or a direct continued Fit of violent Cold, or Excesses in Eating or Drinking, one or all of these have a large Share in most of our continued Fevers.

10. *Lastly*, It is no Ways accountable from any other Theory, (as I think) how these Liquors which are secreted from the Glands at the Dissolution of Fevers could be so different from the ordinary Fluids which are there excretd? From ours, it is evident, for an Obstruction of the Glands must necessarily make their respective Liquors to stagnate, which will many Ways alter their Nature: But from any other Hypothesis I do not see how this can come to pass; which will lead me to consider One or Two of the commonest Opinions about continued Fevers.

The most common and generally obtaining Opinions about Fevers, is, That they are more immediately produced by some Morbifick Matter (like a Poison), which mixing and circulating with the Mass of the Blood, produces all those frightful Symptoms which we feel. This Opinion is sufficiently confuted, *Prop.* 222, 223, 224. *Part 2.* of *Borelli's Book De Motu Animalium*, whither I refer the Reader, only adding (to what he has there adduced) this one Argument.

When any corrupt Matter is mix'd with the Blood, so as to vitiate the whole Mass, (as Vinegar among Water) the Way of curing such a Vitiatio is either by forming new Glands to derive the vitious Part of the Mixture; or by draining the whole Mixture, good and bad, and substituting new pure Blood in its Place; or, lastly, by disposing the already form'd Glands to secrete the corrupted Part.

The First of these is ridiculous.

Some Thing like the second is done, when the Blood is really viciate in the Whole, as inveterate Poxes; but that Cure cannot here have a Place, as shall be afterwards shewn.

As to the third Way, let us consider:

1. How hard it is to think, when the whole Mass is supposed corrupted, that the vitious Part all at once, or in the Space of a few Hours, (in which we know, after a *Crise*, Fevers commonly leave People) should be entirely evacuated. This is not like the Actions of Nature, who works leisurely and by Degrees.

2. Let us consider whence all the Glands (at least the greater Part of them) should be so alter'd (seeing their Configurations are so different, and naturally they seern so different Liquors) as all at one Time to separate the same Morbifick Matter. And,

3. How at the Crise only, and at no other Time, they should be so dispos'd.

It will be very hard in any other Theory (in this more particularly) save ours, to account for these Things without recurring to Miracles, or the absurd *Metaphorick* Terms of Sympathy, Antipathy, and the like. These then, with what *Borelli* has brought against this Opinion in the forecited Places, are abundantly sufficient to show the Ridiculousness thereof.

But there are several Physicians, who observing, that in Fevers there was (by a Vomit) a tough viscid Matter thrown out of the Stomach, have thought this Matter generated there, and mixing with the Mass of the Blood, might be a considerable Part of the Cause of Fevers, at least might considerably augment the same, and have from thence brought Arguments for the Necessity of Vomiting in Fevers.

This Opinion supposes these Things :

1. That the Quantity of the *Morbifick* Matter excern'd by a Vomit, before the Administration thereof, was existent in the Cavity of the Stomach, after the same Manner that other Things are which are derived into the Mass of the Blood, else it could never get thither. This I shall consider when I come to speak of the Operation and Effects of Vomiting.

2. That it is at least possible this *Morbifick* Matter may be deriv'd into the Mass of Blood. Let us at present consider this.

I know no Way any Thing of any tolerable Consistence can get into the Mass of the Blood, but by the *Lacteal Veins*. It is true, from the sudden Effects of some Spirits, Medicines, and strong Meats, we are certain that the more refined Parts of these may get into the *Brain*, without going the tedious Circle of the *Lacteals*: But this is done by the reciprocal Motion of the *Nerves*, the Necessity and mechanical Operation of which *Borelli* has demonstrated, *Prop.* 155, 157, 160. part. 2. *de Motu Animalium*. However, I think none will pretend such a Course

for this viscid *Morbifick* Matter; and therefore if it gets into the Mass of the Blood, it must go the common Road of the *Lacteals*.

To decide the Matter, I must suppose my Reader to have consider'd the two last *Propositions* (*ex iis quæ ad Separationes*) which *Bellini* has in his Preface to his Book *de Urinis & Pulsibus*, &c. and the 27th, 28th and 40th, of his last Book *de Motu Cordis*, &c. where the Construction of the Glands, and the Manner of Separations, are demonstratively unfolded, which I take to be the noblest Discovery (in these Matters) of this Age. From these Places it is clear, that,

Prop. 1. A Gland is nothing but a great many Complications and Circumvolutions of the Artery, (all over the Coats of which little Branchings of Nerves pass, design'd principally for the spiral Contortion thereof, that the Blood may be the more easily propagated through the same; but this is common to all the Arteries and Veins, whereby, without any Interruption of the same Spire, the Propagation of the Blood (in the former) from the Heart to the Extremities of the Body, and from the Extremities to the Heart back again (in the latter) is assisted) which sends out from the Sides thereof little Secretory Canals, which terminate in one common Conduit, and is call'd the *Emissary* of the Gland; or perhaps in a common *Pelvis*, (as in the *Kidneys*;) and the same Artery after these Windings degenerates into a *Vein*.

Prop. 2. That Separation or Secretion is perform'd by the Composition of two Motions in the Fluid; one propagated through the Length of the Canal, another transversely through its Sides; for it is demonstrable, that all Fluids press *undiquaq;* and that the Direction of their Pressure is perpendicular in every Point to the Sides of the containing Vessel; the Composition of which two is the Motion (or rather Direction) of the separated Fluid.

Prop. 3. That in a mix'd Fluid, consisting of greater and lesser Cohesion of Parts of greater and lesser Fluidity, that which has the least Cohesion and greatest Fluidity is first separated, i.e. is separated in the Glands, whose compounding Artery is shortest, or at least Distance from the Heart or Fountain of Motion; and these of the next Cohesion, and next greatest Fluidity, is next separated;

and

and so on; the Distances from the Heart being in a compounded Proportion of these.

Prop. 4. That the *Intestines* are really such a *Gland*, and the most visible one in the Body, whose Secretory Vessels are the *Lacteals*, and whose common Conservatory or *Pelvis* is the *Receptaculum Chyli*.

To these I shall add (because of its Affinity) the following:

Prop. 5. The Quantity separated in every *Gland* is in a compounded Proportion of the Celerity of the Fluid at the respective Orifices, and of the Orifices themselves of the separating Canals.

I shall here subjoin the Demonstration of this Proposition, referring that of the rest to their Author.

DEMONSTRATION.

THE Orifices being given, the Quantity separated is as the Celerities of the Fluid; for in a greater Celerity, there is a greater Quantity separated; in a less Celerity, a lesser Quantity. The Celerities being given, the Quantity separated is as the Orifices; for at a great Orifice, there is greater Quantity separated; at a less Orifice, a lesser Quantity: And therefore neither being given, the Quantity separated is as the Celerities and the Orifices conjunctly, *q. e. d.*

From all these I draw the following

COROLLARIA.

1. THE separated Fluids differ only in their Degrees of Cohesion and Fluidity, per Prop. 2.

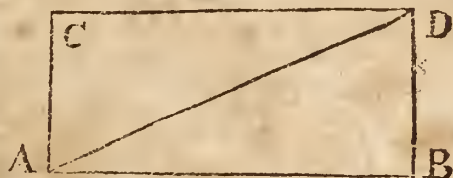
2. The Reason why Fluids of different Degrees of Cohesion and Fluidity are separated in such and such *Glands*, is the different Degrees of the Velocity of the Fluid at the respective Orifices of the separating Vessels, and the Differences of the Orifices themselves, per Prop. 3.

3. The *Glands* themselves differ only in the Length of the *Artery*, the Difference and Number of its Complications and Convolution, per Prop. 1.

4. Each *Gland* (naturally and equally working) separates only the Fluid proper to it self, *i. e.* peculiar to such Lengths and Complications, of such Degrees of Fluidity

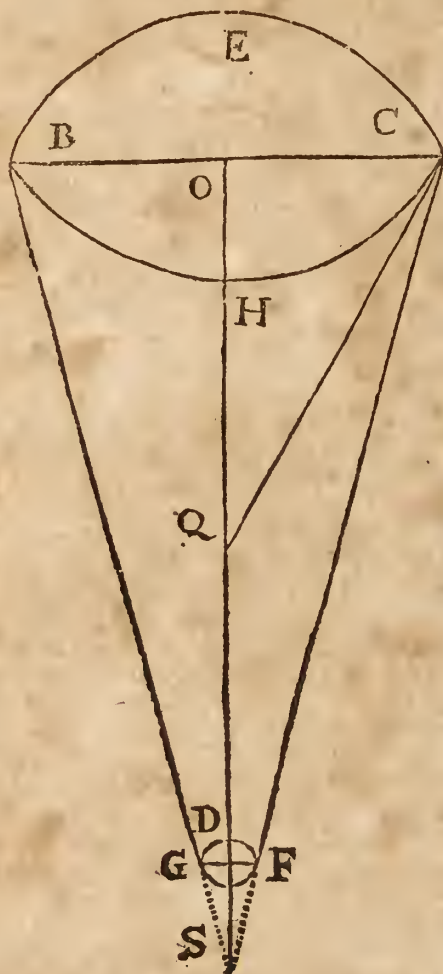
or Cohesion, to such Bigness or Smallness of the Orifices of the separating Canals, per Prop. 3, and 5. But this last is of small Consideration.

5. That Secretion may be performed the most easily that may be, the Insertion of the separating Canal ought to be at an Angle of 45 Degrees with the *Artery*, per Prop. 2. For



let A B represent the *Artery* (if it make a right Line) or its *Tangent* (if it make a Curve), and let the Motion of the Fluid be from A to B, the right Line A B will likewise represent its Direction propagated from the Heart. Erect at A, the perpendicular A C; this will represent the Direction of the lateral Pressure of the Fluid. Compleat the Parallelogram A B C D; the Direction of the Composition of these two Motions will be the Diagonal A D, as is known; which in the present Case makes an Angle of 45 Degrees with the *Artery* A B. This were well worth the observing (if it be possible) in Animals; but it must be in live ones, before their Parts have alter'd their Positions. And here it were worth the examining likewise, whether what Mr. Newton has demonstrated (*Schol. Prop. 35. Lib. 2. Princip. Phil. Mathem.*) about the Resistance of *Conical* Figures, obtains in Animal Bodies; for though his Demonstration be only concerning *convex* Cones, yet the same obtains in *concave* ones; wherefore seeing the *Artery* betwixt any two Branchings is a *Conus truncatus*, it may be represented by the Figure following, C E B G F. Now seeing the Diameter C B of the Base of this *Conus truncatus*, and the Diameter F G of the Base F D G of the *Conus abscissus* F D G S, as likewise their Distance O D, may all be had, it is evident that the entire *Cone* C B G S H may be had likewise: Wherefore bisect the Distance O D in Q; and if it be found (having drawn C Q) that Q S is equal to Q C,

Q C, then the *Conus Truncatus* (E B G F among all of the same Base and Altitude) gives the leſt Reſiſtance to the Blood flowing from O to D. I am inclined to think



this may obtain in the Trunks of the great *Arteries* betwixt their Branchings, for no further is to be consider'd. This I recommend to be examined for the Honour of that great Man, who has crowded up in this *Scholium* (not to mention the rest of his admirable Book) a vast Number (if retailed) of most charming and useful Truths.

To come now to the Pusinets. The *Testiculi Humani* are granted by every one to be *Glands*; and *Bellini* has found the Length of

the complicated *Artery* in one of them to be 300 Ells, and the Altitude of one of these *Glands* (when freed of its Integuments) to be $\frac{1}{12}$ Ell; whence I conclude, there must be 4800 Plications or Circumvolutions in one of these *Proxime*. He likewise asserts, that (*ceteris Paribus*) if two Fluids of the same Nature, with equal Velocities, the one be forced into a Canal of the same Number and Length of Complications as are in the foreſaid *Gland*, and the other into a straight Canal of the same Length, the Velocity (in or about their *Exits*) of the first Fluid, to that of the second, will be as 1 to 4800. He has not indeed subjoin'd the Demonstration: But if we suppose the *Artery* to lie in *Plica* or Folds of such Number and Length, as we have just now determined (which is perhaps not far from Truth); and if we suppose the Turnings of the *Plica* to be circular, (which perhaps may follow from this, that seeing a Circle is the only ordinate Figure of an infinite Number of equal Sides and equal Angles, it must be the only *Curve* which can make (in all its Parts) the Angle of Incidence equal to the Angle of Reflexion, and consequently the only *Curve* in which a Fluid would most easily turn;) and likewise the Arch in which they turn to be a Semi-circle, which it must be, if the Sides run parallel after the Turning; and universally, if the Sides produced make any Angle from the Quantity thereof, the Quantity of the Arch in which they turn may be determined: I say, from these *Data* the former Proportion may be by Calculation examined; or perhaps more briefly by Experiment, thus:

Take a Pipe of Metal of any Diameter, and fold it into any determined Number of *Plica*, whose Sides may run parallel, and whose Lengths may be $\frac{1}{12}$ Ell: Then by a Weight force a Liquor through it, and observe the Time betwixt the first Entry of the Liquor into the complicated Canal, and its first Appearance at the other Orifice; then take another straight one of the same Length with the former, and with the same Weight force the Fluid through it, observing the same Way the Time of its Passage. The Lengths being the same, the Velocities shall be as the Time of passing reciprocally, as is known. Having thus got the Proportion

of their Velocities in any one determined Number of *Plica*, we may (by the Rule of *Three*) have their Proportions in any assign'd Number thereof. Supposing then that this great Man has found the Truth of the fore-said Proportion from some such Way as one of these, it follows, that in every Turning the Velocity must be abated $\frac{1}{4800}$ of the whole *Proxime*; (for $4800 . \frac{1}{4800} :: 4800 . 1$.) Now let us suppose the Proportion of the Cohesion and Fluidity of the Fluid separated in the *Testiculi Humani* to the Cohesion and Fluidity in our *morbifick* Matter, now derived from the Stomach into the small *Intestines*, to be as 1 to 2. (I mean, the Cohesion and Fluidity of the Fluid separated in the *Testiculi Humani* as it is when immediately separated; for when it has lodg'd any Time in the *Vesicula Spermatica*, we know, by its Ebullitions, and the Evaporation of its thinner Parts, it loses a great deal of its Fluidity.) And that this is a liberal Allowance, is evident from *Leewenboeck's* Experiments scatter'd up and down the *Phil. Transf.* and printed all together at *Amsterdam*; where we may see, from the *Microscopical* Observations he has made on this Fluid, its Fluidity is little less than that of common Water; and consequently, at least ten times more than that of our *morbifick* Matter.

And here I hope it will not be impertinent to set down a Proposition to compare the Viscidities of different Liquors.

PROPOSITION.

LET two Drops of two different Liquors fall into a Pair of fine Scales, (a Drop of the one Liquor into the one Scale, and a Drop of the other Liquor into the other Scale) so that there fall no more than just their own Gravities carry down: Thus you shall have what I here call their comparative Gravities, and by the ordinary Method, you may likewise have their specifick Gravities. There being given, I say, their Viscidity and Cohesion shall be in a compounded Proportion of their specifick Gravities reciprocally, and their comparative Gravities directly. The Demonstration is easy from the Nature of Fluids.

Let us again suppose the Length of the

small Guts (for it is there only where any Thing is separated from the *Intestines*) to be 6 Yards, and that in every $\frac{1}{4800}$ of a Yard, there is a Plication; (and that these are likewise liberal Allowances, any who have ever seen a Dissection will know) then there will be 96 Plications in the whole, and consequently the Fluid in these *Intestines* will lose but 96 Parts of the whole Celerity it had at its Entry.

Lastly, Let us suppose that Celerity to be equal to the Celerity of the Blood, when it first enters the Plications of the *Testiculus Humanus*; which all will readily grant who consider, that there is never any Thing found in these small Guts, but a thin Liquor in a wide Canal, thrust forward by the Force of the *Fibres* of the *Stomach* and *Intestines*. Let us call this Celerity *a*.

Now from *Corol.* 1, 2, and 3, about Separation, if a Viscidity as 1 give 4800 Plications, then a Viscidity as 2 will give 9600 such: And therefore, that such a viscid Liquor should be separated, it is requisite it should lose 9600 Parts of the whole Celerity; but (as has been just now shown) by the *Plica* of the *Intestines*, the Fluid will lose but 96 Parts of the Celerity *a*. Whence it is absolutely impossible that the *Intestines* should separate this viscid Matter, unless they were a hundred times longer than they are; for $96 . 9600 :: 1 . 100$. If the Viscidity of the Fluid separated in the *Testiculus Humanus* were to that of our *morbifick* as 1 to 10, then the small *Intestines* behoov'd to be five hundred times longer than they are. And indeed I believe the Proportion really not to be under 1 to 50, and then they behoov'd to be at least 25 hundred times longer than they are.

Thus we see the second Thing this Opinion supposes is false; and indeed it hardly could be otherwise; for (in my Opinion) the *Faces* themselves might more probably get into the Mass of the Blood than this viscid Matter, the Parts of these being only united by a simple Contact; whereas the Parts of this are join'd by a very strong *Nisus*. And I remember, *Dr. Lister*, somewhere in the *Phil. Transf.* relates how he tried to get in a very fine ting'd Spirit into the *Lacteals* of a live *Dog*, by cutting the small Guts, and injecting the Liquor, then
sewing

sewing all up again; but he could never get it done to his Satisfaction. And here it is to be observ'd, that People may be deceived with blue Tinctures; for this is the natural Colour of these *Lacteals* when they are almost or altogether empty.

If it be objected, 1. That the Concoction of the *Stomach* and *Intestines* may fit this *morbifick* Matter to be separated by the *Lacteals*. 2. That the *peristaltick* Motion and the *Valves* of the *Intestines* may hinder the quick Motion of the compounded *chylous* Matter. 3. That there are some Medicaments, as *Turpentine*, &c. which we know, by their Effects, get into the Mass of the Blood, and yet are more viscid than our *morbifick* Matter. 4. That there is really as viscid Matter separated in some other *Glands*, as the *Bile* and the *Phlegm*.

To these I answer,

1. As to the First; seeing *Triture* is the only Effect of the *Stomach* and *Intestines*, there is no Advantage to be reap'd thence; for no Beating nor Grating will dissolve the Union of this *morbifick* Matter. Besides, where it is in any Plenty, the Effects of Concoction are very small, or none.

2. As to the Second; the *peristaltick* Motion being reciprocal, it adds as much to the Motion of the *chylous* Matter in its Descent towards the *Rectum*, as it takes away in its Ascent towards the *Stomach*, and so cannot serve that End, the *Plica* and Circumvolutions of these *Intestines* (which we have consider'd) being only to be rely'd on for this Purpose. As to the *Valves*, we know they all open toward the *Rectum*, and serve only to stop the Ascent of the *Feces* in the *peristaltick* Motion, and so cannot retard the Motion of the *chylous* Matter.

3. As to the Third; we likewise know, that all these Medicaments are dissolv'd into a thin Liquor by Heat (as *Turpentine*, *Butter*, &c.) Besides that, only the most spirituous and least viscid Parts enter the Blood, which is not said of our *morbifick* Matter.

4. As to the Last; there is a great Difference betwixt a Liquor immediately after it is separated, and when it has stagnated some Time in the Conservatory of the *Gland*; for then the aqueous and more humid Parts evaporate, and by its Stagnation it acquires

an Ineptitude to Motion; and tho' the Blood flows very easily in the *Arteries* and *Veins*, yet I defy any to cause extravasate Blood to enter its Vessels again. But more particularly, we must consider the *Liver* to be a very large Vessel, and (if it were evolved) to make an *Artery* many thousand times longer than that of the Canal of the small *Intestines*, or *Testiculus Humanus* either; and so it is no Wonder it separate a viscid Matter, the Motion of the Blood there being very small: But still I assert it is not near so viscid as our *morbifick* Matter. As to the *Phlegm*, we know it is not naturally produced; and the *morbifick* Matter it self (against which we dispute) might be as well objected; for it is only the Stagnation, Corruption and Evaporation of the Humidity, which occasion both. The same might be said of the purulent Matter which passes by *Urine*, but that we know it proceeds from an *Ulcer* in the *Kidney* or Neck of the *Bladder*, and is not fecern'd with the *Urine*.

Having dwelt thus long on the Opinions of others, I come now to consider the proper Remedies of Fevers; which I reduce to, 1. *Blood-letting*; 2. *Vomiting*; 3. *Purging*; and, 4. The *Medicaments* which increase the less *sensible Evacuations*; under which Head I comprehend Sweating, Perspiration, and the like.

I do not here consider Blistering, and outward Applications, seeing (in my Opinion) they are only useful to remove the accidental Effects, and not the Cause of Fevers, without which they cannot be said to be truly cured.

1. As for *Blood-letting*. The Subject is so fully and learnedly treated by *Bellini* in his forementioned Books together, that it were equally impossible as impudent to offer at any Additions; and therefore, for entire Satisfaction on this Head, I shall refer my Reader to these Books.

2. As to *Vomiting*; I shall comprehend all I have design'd to say about it in these Particulars: 1. I shall shew that *Vomiting* is partly produced by the *Vis stimulant Vomitorii*: But, 2. That it is mostly occasioned by the *Vis stimulant* of the *morbifick* Matter excern'd from the *Glands* of the *Stomach*. 3. I shall

shall prove that this *morbifick* Matter is not in the Cavity of the *Stomach* (at least in such Plenty as it is excern'd by a forc'd Vomit) before the Ingestion of the said Vomit. 4. I shall give the whole Deduction and Connexion of this Operation. 5. I shall consider the Advantages of the same in the Cure of Fevers.

Before I come to handle these, it is necessary I first explain what I here mean by a *Vis stimulans*.

By a *Vis stimulans*, I understand such a Quality in a Fluid, whereby the Particles thereof are dispos'd to make a real Division, or a violent Inflexion, of the *nervous* and *membranous Fibres* of the Body, which occasions frequent and forcible Reciprocations, Succussions and Derivations, of the *Liquidum Nervorum* into the *Muscles* and contractile *Fibres* of the Canals; whereby all the involuntary *Muscles* are brought into violent Contractions, and the Emissaries of the *Glands* are squeez'd.

Those who desire a fuller Account of the Nature and mechanical Operations of this *Vis stimulans*, may see it *Pag. 165 & seq.* of *Bellini's Book de Urinis & Puls. & Prop. 52* of his last Book *de Motu Cordis*. I say then,

1. Vomiting is partly produced by this *Vis stimulans Vomitorii*. This is evident from these Considerations: 1. Because sometimes we immediately vomit upon the Ingestion of the Vomitory, before the *morbifick* Matter excern'd from the *Glands* of the *Stomach* could have Time to concur. 2. We throw up very often the same we had taken in, with little or no Mixture; which could not happen, if the *morbifick* Matter had concurred to produce the Fit. 3. Sound Persons (in whose *Stomachs* there is little or none of this *morbifick* Matter) often vomit upon a too plentiful Ingestion of an (otherwise) inoffensive Liquor; the only Reason of which must be, that the *Stomach* not being able to derive into the Mass of the Blood the said Liquor so fast as it is pour'd in, it must sower on the *Stomach*, and thereby acquire this *Vis stimulans*, whereby it is thrown out; or perhaps it may still have a *Vis stimulans*, though not (when it is in a small Quantity) sufficient to bring the *Stomach* into that violent Contraction which is necessary in Vomiting: But this small *Vis*

stimulans being multiplied by the too great Quantity of the Liquor, may acquire sufficient Force to produce the Effect; as we see several Things lose the Quality to produce their visible Effects when in small, which they had when in great. But,

2. I say, Vomiting is mostly occasion'd by this *Vis stimulans* of the *morbifick* Matter excern'd from the *Glands* of the *Stomach*; and that for these Reasons: 1. The Action of the *Vis stimulans Vomitorii* being terminated at or near the internal Surface of the *Stomach*, after one or two plentiful Fits of Vomiting (there being produced thereby such a Succussion and Compression of the Sides of the *Stomach*) these *Particulae stimulantes* must necessarily be disentangled, and so there could be no more Fits of Vomiting, which is contrary to Experience. 2. We evidently see in Sea Vomits, and in those produced by the Joltings of a Coach in some People, there is no *Vis stimulans Vomitorii* to which we can attribute this Effect; and therefore it must necessarily be produced by the Vellications of the *morbifick* Matter excern'd by this particular Motion; the Manner of which may be thus explained: Every particular Body has a determined Degree of Tension, and a determined Length; and if a like Reciprocation of Motion (by whatever Cause) be produced in the ambient *Medium*, which would necessarily be produced by another Body (when moved) of the same Degree of Tension, and of Length commensurable to the Length of the first Body, there must be of Necessity a Motion produced in that first Body, especially if the Motion of the *Medium* be violent, and the commensurable Lengths be as the first Numbers of the ordinary Arithmetick Progression, 1 to 2, or 1 to 3, or 2 to 3, &c. This is evident in the unison or concordant Strings of greater Musical Instruments; and the Reason is, because thereby the *Oscillations* of such Bodies become commensurable. Now I suppose this particular Motion of jolting Coaches and Ships, to be such as would be produced by another Body having the just now mentioned Analogy to the *Nerves* of the *Glands* of the *Stomach*, whereby they are brought into Motion, and consequently derive great Plenty of their *Liquidum* into the Places, which makes such Contractions

as squeeze these *Glands* of the Matter that produces these Fits of Vomiting. Besides that, the same Cause may (upon other *Fibres*) produce the antecedent Sickness which we feel in Sea Vomits. 3. By a Vomit of warm Water (for Example) there are often produced several Fits of Vomiting; and yet we all know there is no *Vis stimulant* in it; so that all it can do is, that by its Warmth (which is a Kind of a *Fortis*) it elicits the Matter from the *Glands* of the Stomach, which occasions this Vomiting. I could add a great deal more to confirm this Proposition, but I think this sufficient. I say,

3. That the *morbifick* Matter (excern'd by Vomiting) is not existent in the Cavity of the Stomach (at least in such Plenty as it is excern'd by a forc'd Vomit) before the Administration thereof. 1. This is an evident Corollary from the former Proposition, The Vomit does not act (at least after the first one or two Fits) by its own *Vis stimulant*. There is (in Vomiting) produced a violent Contraction of the *Fibres* of the Stomach, the *Muscles* of the *Abdomen* and *Diaphragm*, which must be occasion'd some Way. There is nothing (in Vomiting) which can occasion this, but either the *Vis stimulant Vomitorii*, or of the excern'd *morbifick* Matter; and since (as has been already proved) it cannot be the former, it must of Necessity be the latter: Wherefore if the *morbifick* Matter were already existent in the Cavity of the Stomach, the Vomit were of little Use after one or two Fits, which is contrary to Experience. 2. If this *morbifick* Matter were already in the Cavity of the Stomach, it is not possible but that one or two plentiful Fits of Vomiting would eject all that is there; so that afterward there should none be thrown out, however violent the consequent Fits were, which is likewise contrary to Experience. The Force of the *muscular Fibres* of the Stomach, the *Muscles* of the *Abdomen* and *Diaphragm*, (which two last Monsieur Chirac, Professor of Medicine at Montpellier, by an easy Experiment, has shewn to concur principally in Vomiting; vide the Preface of Tournfort's *Histoire des Plantes qui naissent aux environs de Paris*) is at least equal to 260000 lb. weight, (the Force of the *Muscles* of the *Abdomen* and *Diaphragm* being more than that of 248000 lb. and of

the Stomach not inferior to that of 12000 lb.) which Force if it be not sufficient to drive out all that is existent in the Cavity of the Stomach (however viscid that Matter be) I leave every one to judge. 3. Supposing the *morbifick* Matter already in the Cavity of the Stomach, it is impossible to give an Account of the different Effects of different Vomits: For Example, why an *Antimonial* Vomit does excern this *morbifick* Matter more plentifully than Whey or warm Water. For if before the Ingestion of either, the *morbifick* Matter is already in the Stomach, then the only Thing left for them to do, is to excite the Act of Vomiting. But it is certain they may be both brought to be equal in that, i. e. they may be both brought to excite an equal Number of Fits of Vomiting, and that with equal Violence, (by taking their Quantities in a reciprocal Proportion to their vomitive Faculties) and yet their Effects be very different. I omit (for avoiding Tedioufness) the other Arguments I can adduce to confirm this Proposition.

4. The whole Deduction and Connexion of this Operation is thus: The Particles of the Vomitory, by their *Interruption* into the Orifices of the *Emissaries* of the *Glands* adjacent to the Surface of the Stomach, do dilate the same, (which by some extrinsick Cause had been contracted) and after the same Manner do dissolve (at least in some Degree) the Cohesion of the stagnant *morbifick* Matter, and render it more fluid, and consequently its Resistance less. Now the natural and constant Action of the *Glands* being Secretion, and the *Impedimentum* (by the Dilatation of the Orifice, and Attenuation of the Fluid) being totally taken away, or at least made less than the natural *Momentum* of the *Glands*, the Matter must necessarily flow into the Cavity of the Stomach, till it be accumulated in such a Quantity (which not being to be done in an Instant, must require some Time) as is sufficient (by the united Loathsomeness and the *Vis stimulant* of it and the Vomitory) to vellicate and force the *Fibres* of the Stomach, *Abdomen* and *Diaphragm*, (by the Communication of the *Nerves* of the first with the two last) into a violent Contraction, and thereby throw all out by the *Oesophagus*, which brings all to Quiet again, till there be

be anew a sufficient Quantity excern'd from these *Glands* to reproduce the foreſaid Contraction. And thus there happens a Fit of Vomiting and Quiet alternately, till either all the *morbifick* Matter be thrown out, or the Force of the Vomit ſo diluted, that it's no longer able to elicit the *morbifick* Matter from the *Glands*. Beſides theſe primary Effects of Vomiting, there are two others, which ought not (tho' leſs principal to be omitted. The firſt is, that in a ſtrong Vomit, or in one which requires ſome conſiderable Time before it operate, there often paſſes ſome Part thereof from the *Stomach* into the *Inteſtines*, and occaſions a gentle Purge, by diſſolving the *Fæces*, and vellicating the *Fibres* of the *Inteſtines*; as ſhall be more particularly ſhown when we ſpeak of *Purgings*. However, the Effects of this Purge very ſeldom or never go beyond the *Prima Viæ*; for all gentle Purges (of which this is one) are confined within theſe. The ſecond is, that the ſtrong Contraction in ſo many *Muſcles* and *muſcular* Canals, which are at Work in Vomiting, and the violent Concuffion which is produced over the whole Body, by a Power (as has been ſaid) which is not inferior to that of 260000 lb. weight, may and often does take away the Obſtructions in many other Canals than thoſe which are more immediately concern'd about the *Stomach* and *Oeſophagus*; as we evidently ſee by that vaſt Sweat which always breaks out after plentiful Fits of Vomiting. From theſe I deduce,

5. The Advantages of Vomiting in the Cure of Fevers; which are, 1. The taking away the Obſtructions of the *Glands* of the *Stomach*, and (ſometimes) of the *Inteſtines*, which is the principal Uſe of Vomiting; and how great a Step this is toward the Cure of Fevers, every one will ſee who conſiders, that in Fevers occaſioned by Intemperance, the *Stomach* is the Scene where this great Miſchief is both contrived and put in Execution, the Obſtruction of the *Glands* thereof being the firſt and principal Cauſe of theſe Fevers. And in Fevers occaſioned by Cold, the *Stomach* and *Inteſtines* being moſt expoſ'd, and leaſt defended from the cold Air, receives its firſt and ſtrongeſt Impreſſions, which two (as formerly was ſaid) have the moſt conſiderable Share in the

Cauſe of our Continued Fevers: And therefore it is, that Vomiting (being timeouſly and plentifully uſ'd) very often prevents ſuch Fevers. 2. Another Advantage of Vomiting is, that by the ſtrong Contraction of the *Muſcles* and *muſcular* Canals, and the violent Concuffions of the whole Body thereby produced, the Obſtructions of many other *Glands* are removed (as has been juſt now ſhown); ſo that this, with the former, (removing ſo conſiderable a Part of the Cauſe) enables Nature to perform the reſt very eaſily. 3. A third Convenience (if not Advantage) of Vomiting is, that it is leſs dangerous than many of the Medicaments that are taken inwardly. The Effects of this is confined to the *Prima Viæ* (by which I always mean that winding Canal which is continued from the Mouth to the *Sphincter Ani*), and is conſequently leſs dangerous than thoſe which run the Circle of the Blood: For it is not to be doubted, that all Alterative Medicines have more or leſs Danger in them, from the Effect of their Stimulations upon the *Nerves*, their Fermentations with the Blood, their ſeparating or promoting the natural Cohesions of the Liquors of the Body, and their many other unknown Productions. That which goes the leaſt Way, muſt therefore have the leaſt Danger. Now ſince it is certain, that Vomiting does not go out of the *Stomach* and *Inteſtines*, (where the Canals are ſtrong and wide, and the Fluids are viſcid and groſs) there muſt of Neceſſity be leſs Danger in it, than in thoſe which enter into narrower and weaker Canals, fill'd with more fluid and finer Liquors. It is true indeed, there is ſome Hazard from the burſting of the Capillary Veſſels of the internal Surfaces, by the violent Concuffions of the Body, occaſioned by Vomiting; but this is eaſily prevented by Blood-letting, which ought always to precede the plentiful Uſe of Vomitories in all Diſeaſes. Beſide, ſometimes the Violence of a Vomit is too great for the Strength of the Patient: But this is rather the Fault of the Phyſician than the Phyſick; for the Strength, and conſequently the Violence of Vomits (as of all other Medicines) ought to be adjusted by this Proportion, viz. they ought to be in a compounded Proportion of the Strength of the Patient,

and the Danger of the Continuance of the Disease. If this were observ'd, none could ever err in the Administration of Medicines.

3. We come now to that which we call'd the third proper Remedy of Fevers, to wit, *Purging*; in explaining of which, I shall, 1. Shew that Vomitive and Purgative Medicines differ only in Degrees of the same Quality. 2. I shall give a short Account of the several Steps, and of the Manner, of this Operation. And, 3. Consider its Use in the Cure of Fevers. I say then,

1. That Vomitive and Purgative Medicines differ only in the Degrees of the same Quality; *i. e.* Purgative Medicines, by increasing their Force vastly, and confining it to a lesser Quantity, either of a Fluid or solid Body, become Vomitive; and Vomitive Medicines (if diluted) become Purgative. This will be evident from these Considerations: 1. We find by Experience, a strong Purge never misfires (if either it be very strong, or the Patient not very strong) to vomit; and the weaker Part of a Vomit, which escapes into the *Intestines*, does frequently purge us. 2. The same Medicines (for Example, *Vinum Emeticum*) taken by the Mouth will provoke Vomiting, which given by Way of *Glisters* will purge. The same obtains in all strong *Emeticks*. In short, all strong Medicines of either Kind constantly produce both these Effects. The Reason of all which is this: If the Medicament of either Kind be so strong as immediately to vellicate and stimulate the *Fibres* of the Stomach, to dilate the Orifice, and attenuate the Matter contained in the *Glands* thereof, it produces Vomiting; if it act but gently, so as only to assist the natural Motion of Digestion, it goes by the *Intestines*, and dissolves the Cohesion of the *Feces*, and finding there more sensible *Fibres*, is able to bring them into violent Motions, which produce Purging; as shall be just now shown. 3. It is impossible in any other *Theory* to account how these two different Medicines should upon the same Parts produce different Effects; for both these Medicines are taken by the Mouth, go down the *Oesophagus*, and enter into the Stomach, either in the Form of a *Liquid*, or are there by it reduced into a *Liquid*, and consequently are

brought in to contact with and operate on the same *Fibres*, *Glands* and *Membranes*, and yet produce (by their Assistance) two different Effects. It is simply impossible to explain the Manner of this, without saying, the one acts more powerfully and forcibly, and makes more violent Contractions, and consequently is thrown up the most patent Way; the other more gently and softly, and has thereby Time to seek out the less obvious Passages.

2. The Account of the several Steps, and of the Manner, of this Operation, is thus: Purgative Medicines being received into the Mouth, and admitted into the Stomach, their Particles vellicate and stimulate the *Fibres* thereof, and thereby increase the digestive Faculties, *i. e.* bring the *muscular Fibres* of the Stomach, the *Muscles* of the *Abdomen* and *Diaphragm*, into more frequent Contractions than ordinary, till they are admitted into the *Intestines*, the *Fibres* and *Glands*, of which being more sensible than those of the Stomach, (whose Parts, by the frequent rough Contacts of one against another, and of the gross Bodies which are often thrown into it, are as it were deaden'd) they easily move and bring them into frequent and forcible Contractions, whereby these *Glands* are squeez'd of a Fluid which lubricates the Passages, and mixing with the saculent Matter of the *Intestines* (which is render'd fluid by the same active and stimulating Quality of the Purgative Medicine) renders it yet more fluid, by which (and by the more than ordinary Contractions of the *Intestines*) it passes more plentifully and easily into the *Rectum*, and is thence ejected. This is the Use of the more gentle Purges, which only cleanse the *Intestines*. But those of more Force (besides all these) do (as to the greater and more spirituous Part) enter into the Mass of the Blood by the *Lacteals*, and mixing therewith, produce many unnatural Fermentations therein, separating or promoting the natural Cohesions of the Liquors of the Body, and occasioning many other unknown Effects, as has been formerly said: And likewise there, vellicating the spiral *Fibres* of the *Arteries* and *Veins*, bring these into more forcible Contractions, and thereby promote the Circulation of the Blood, and make it run with greater Velocity.

city and Force; and by this Means in a short Time wash away any Obstructions, that either happen to be in the more direct *Arteries*, or the more complicated ones which constitute the *Glands*, increase the insensible Perspiration, and purify the Blood of all the grosser and more noxious Parts by the *Ductus Choledochus* and *Pancreaticus*, which void themselves into the *Intestines*. All these Effects of the more powerful Purgatives are visible; for sometimes after one has taken such a strong Purge, we find the Pulse mightily increas'd, the Perspiration augmented, the Spirits or *Liquidum Nervorum* spent, the visible Excretions by Sieges and Urine much greater, and the Body weaken'd, especially after a few Days of such a Course; whereby it is evident, these Medicines must operate after the Manner now explained. From hence it is clear,

3. That the Advantages of Purging in the Cure of Fevers are very great, upon these two Considerations: 1. If the Purge be more gentle, so that it only serve to cleanse the *Intestines*, it partly takes away the Obstruction of the *Glands* of the *Stomach*, and totally that of the *Glands* of the *Intestines*, which is a considerable Step toward the Cure. But, 2. If the Purge be more violent, so that it enter in any Plenty into the Mass of the Blood, it conduces so much toward the Removal of the Obstructions of most of the other *Glands*, that Nature is able to perform the rest very easily herself. But alas! this last Case has so much Danger and so many Inconveniencies in it, as render it as unsafe, as otherwise (if these could be remov'd) it would be useful. *Bellini*, in his Book *de Urinis & Pulsibus*, page 222. has demonstrated, that in violent Purges there is a greater Danger by far than in Blood-letting. His Words are: *Quia vero quicquid est Suspicionis in Missione Sanguinis ad solum Fermentationem non naturalem, quæ possibilis per ipsam est in reliquo Sanguine, redigitur, & hoc uno de Nomine Periculo non vacat; si igitur hujus Mali Suspicionem careret Purgatio, illa potius adhibenda quam Vena Sectio, cum Purgatio ejus loco cateroquin esse possit. Sed Res e converso se habet, Suspicio enim ejus Mali a Missione Sanguinis est Suspicio Rei possibilis, non tamen necessario prævenientis, aut necessario conjunctæ, cum qualibet Missione Sanguinis; in Purgatione au-*

tem necessarium semper est Sanguinem solvi a naturalibus Cohesionibus, seu recedere & dimoveri a sua Compositione: In Purgatione igitur Periculum erit certum, in Vena Sectione dubium; hoc est, erit Purgatio Vena Sectione periculosior, &c. And there he goes on to shew how much more dangerous Purging is than Blood-letting. From this, and a great deal more he has there adduced, it is evident, 1. That violent Purges have a great deal of real Danger in them absolutely, without respect to other Remedies; and indeed these unnatural Fermentations and Changes of the Cohesion of the Fluids, instead of promoting the Cure, often increase the Cause of Fevers, to wit, the Obstruction of the *Arteries* which constitute the *Glands*. 2. That violent Purges are respectively much more dangerous than Blood-letting; wherefore this last is a more safe, and consequently a more useful, Expedient in the Cure of Fevers than the former. And I say, 3. That violent Purges are a much more dangerous Remedy in Fevers than Vomiting is; for Vomits extend no further than the *Prima Via*, where the Canals are strong and wide, the Fluid viscid and gross; but violent Purges reach all the slender Vessels and noble Liquors of the Body, where the Danger of any considerable Alteration is extremely great: Wherefore upon this Account, I say that the Danger of violent Purges is to that of Vomiting, as the Length of the Canals of the whole Circuit of the Blood is to the Length of the Canals of the *Prima Via*. And how much longer the first is than the latter, I leave the Reader to consider. Besides all these, there are so many other known and evident Dangers in violent Purges, that the only Part of Purging which is safe (in curing Fevers) is *Glistering*, or the *Lotiones Alvi*; or rather than either of these, only that gentle Purge which is the Concomitant of every plentiful Vomiting.

4. We are come now to the last proper Remedy of Fevers, which was, the *Medicaments* which increase the less sensible Evacuations. But all that can be pertinently said on this Head, is so learnedly and accurately already handled in a Treatise, Entitled, *Archibaldi Picarnii Dissertatio de Curatione Februm quæ per Evacuationes instituitur*, that thither I shall

shall refer the Reader, only adding the Reason why such Medicaments (administred in the Beginning of Fevers) do rather increase than cure them, which is this: In an Obstruction of the *Glands*, the Blood in the complicated *Arteries* which constitute the same, stagnates up to the next Branching thereof, nearest the Heart, and thereby a considerable Length of it becomes obstructed and unpassable. The only Way this Obstruction can be removed is by the Force of the Blood, which (in every Pulse or Contraction of the Heart) washes off a Particle of the same, till the whole be digg'd away; as shall be shown. Now the *Arteries* which constitute the *Glands*, whereby the insensible Evacuations are naturally fecern'd, being in the Beginning of the Fever so much obstructed, it is simply impossible for such Medicaments to carry these Obstructions off as they are just now: They must rather force through the superficial *Arteries*, and these few other *Glands* that are (perhaps) left passable, the natural Humidity only, *i. e.* the thinnest Parts of the Blood, and consequently make it more viscid, and thereby the Obstruction more firm, *i. e.* will increase the Fever; whereas when a great deal of these Obstructions in the *Arteries* are wash'd away by the Force of the Blood, *i. e.* in or near the Decline of these Fevers, such Medicaments will be able to force the small Remainder of these Obstructions, either through the Orifice of the *Gland*, or into the continued *Vein*, till by frequent Circulations it be either lost, or thrown out of the Body.

From all that has hitherto been said about the Cure of these Fevers, it is evident,

COROLLARIA.

1. **T**HAT the first Thing incumbent upon a Physician in the Case of these Fevers, is to let a considerable Quantity of Blood, both in order to remove the Cause of these Fevers, and to prevent the Inconveniencies of the subsequent Vomiting. *Belini*, in *Prop. 5 & 6, de Febribus*, has demonstrated, that *Vena in omni Morbo est secunda, in quo minuenda Quantitas, aut augenda Velocitas, aut refrigerandum aut humectandum, aut aliquid adherens Vasis dimovendum aut abri-*

piendum; than which there could be nothing more pat to our Theory.

2. The second Step in the Cure of these Fevers is Vomiting; for it at least removes the Obstructions of the *Stomach* and *Intestines*, and goes a great Length to take away the Obstructions of most of the other *Glands* likewise. This especially obtains in Fevers occasioned by Intemperance or 'old; as is evident from what we have said about Vomiting. But as for Purging in Fevers, there is very little more safe than what is the necessary Concomitant of all such Vomitings.

3. The last, but most universal and surest Step, is the increasing the less sensible Evacuations: But this must be used only in the Decline of these Fevers; as has been just now shown.

I have in this Place only determined the Order, and the several Degrees of the Efficacy, of these Remedies (in the Cure of Fevers) with respect to one another; their Kinds and Quantities being to be adjusted by a former Analogy I have given, when I was speaking about the Advantages of Vomiting.

But here it may be very fairly asked, Why (since I make the Obstructions of the *Artery* and *Nerve* which constitute the *Glands* the principal Cause of Fevers) do not I allow Mercurial Medicines (which all grant to be one of the most proper, and perhaps *specifick*, Remedies of Obstructions) to be one of the Steps of the Cure of these Fevers?

Before I answer this Question, I shall, 1. Explain the Nature of Mercury; 2. I shall shew the Manner of the Operation of these Medicines; 3. The Advantages and Usefulness of them.

I. *As to the first I suppose,*

1. That pure Mercury or Quicksilver consists of Parts (I mean those of the first Composition, by which I understand an Aggregate of the smallest and last constituent Particles of any Body, and an Aggregate of these Aggregates I call of the second Composition; and so on) exceedingly small, equal, and perfectly spherical.

This has been suppos'd by all who have written any Thing tolerable about the Nature of this Mineral. It is true indeed, some have suppos'd it so, because they saw that di-

dividing Mercury upon a Plane (even by the Assistance of a Microscope) still the upper Part retained its Sphericity, which they could not so easily observe in other Fluids: But the true Reason of this is, the great Gravity of the Mercury, in respect of other Fluids, and the uniform Pressure of the Medium; for all Fluids will retain their Sphericity, till their Quantity be so diminish'd (either by their being another heterogeneous specifically lighter Body included in them, or by their Gravity decreasing at a greater Rate than their Surfaces) that they are of equal Gravity with an equal Portion of the Medium they are in, and then they will receive any Figure the Motion of the Medium can imprint on them. However, the Divisions of Mercury must be very small before it can be reduced to this State; but that it can at last be brought to it, is evident from the mixing and pounding of Quicksilver among common Water, in which we know a Part of the Quicksilver is lost, by the Diminution of its Weight, and the Discolouring and Effects of this Water.

But the true Reason why the former Supposition is to be made, is, because from it some of the *Phænomena* of Mercury may be accounted for.

For from thence it is evident, why Mercury (though the heaviest known Fluid) rises with fewer Degrees of Heat in an Alembick than any other. 1. Its Parts (of the first Composition) being exceedingly small, *i. e.* smaller than such Parts of any other Fluid, it must rise sooner than they; because the Gravity of its Particles has a lesser Proportion to their Surfaces, than the Gravity of the Particles of any other Fluid has to their Surfaces; for the Gravities of Bodies decrease in a triplicate Proportion, whereas their Surfaces decrease only in a duplicate one. Thus supposing (for Example) the Diameter of a Particle of Mercury (of the first Composition) to be to the Diameter of a Particle of Water (of the same Composition) as 2 to 300, (and we may justly suppose the Odds infinitely greater) their Surfaces will be as 4 to 90000; and their Solidities, *i. e.* their Gravities, as 8 to 27000000. This upon Supposition their specific Gravities were equal; but supposing (at the largest) the specific Gravity of Mercury

to that of Water as 15 to 1, the real Gravities of such Particles will be to one another as 120 to 27000000: Whence it is evident, that not only the *Ratio* of 8 to 4, or 2 to 1, but likewise the *Ratio* of 120 to 4, or 30 to 1, is much less than that of 27000000 to 90000, or 300 to 1. And therefore upon such Supposition it will follow, that the Gravities of such Particles of Mercury would be much less than that of such Particles of Water; and that the Surfaces of these Particles of Mercury would be much larger, in respect of their Gravities, than that of the like Particles of Water, in respect of their Gravities; and consequently the Mercury would rise in the Alembick with much fewer Degrees of Heat than the Water upon this Account. But, 2. The Particles of Mercury are perfectly spherical and equal; (for all homogeneous Bodies must consist of Particles *similes & æquales* in the *Euclidean Sense*; *vide Def. 1. 6, & 9, 11 Euclid.*) and consequently can only touch in Points, and thereby their Sublimation will become more easy. A Sphere can be touch'd but by 12 other equal Spheres, and that too but in so many Points; and if we suppose the superficial Particles of the Mercury to be first rais'd in the Alembick, they can be touch'd only by 9 other. Now the Force and Value of such a Contact as this of 9 Points, is less (*cæteris Paribus*) than that of other solid Bodies generated by the Circumrotation of whatever Figures, regular or irregular, right-lined or curve-lined; for the Contacts of Circles are the Measure of the Contacts of all other Figures whatsoever; and tho' in some Curves their Contacts in some Points may be less than that of Circles, (*vide Scholium Lem. 11. Princip. Phil. Mathem. Newtoni*) yet in all their other Points they will be proportionally greater, and consequently the Value of the whole Contacts greater than that of Circles: Wherefore it is evident, that spherical Bodies will be more easily separated than any other, and consequently will rise in the Alembick with fewer Degrees of Heat than any other. *I suppose,*

2. That the only Effect of the Sublimations, and other Preparations of Mercury, is the dividing it into these Parts of the first Composition, which are spherical *per Suppos.* 1; or into Parts of a more complicated Com-

Composition, which (by reason of the vast Gravity of Mercury, in respect of other Fluids, and the uniform Pressure of the Medium) may be still spherical; for if the Mercury be pure, and no heterogeneous lighter Body be mix'd with it, it will still retain its Sphericity, till the *Ratio* of the Surface of a Particle of Mercury to its Gravity, be to the *Ratio* of the Surface of a Particle of Air to its Gravity, as is the specific Gravity of Mercury to the specific Gravity of the Air, *i. e.* (putting the specific Gravity of Mercury to that of Air as m to n , and the Diameter of a Particle of Mercury x , and that of a Particle of Air a .) till $m . n :: \frac{1}{x} . \frac{1}{a}$, then x will be equal to $\frac{n a}{m}$, that is, (supposing a equal to Unity as the Standard, m to n , as 10800 to 1 *proxime*, as all know) the Diameter of a Particle of Mercury must be 10800 times less than that of a Particle of Air, or the Particles of Mercury themselves 1259712000000 times less than these of Air, before they lose their Sphericity. Now besides these Divisions into spherical Particles, the saline Bodies, which are mix'd with the Mercury in these Preparations, keep these asunder and disjoined, like so many congeal'd little Bullets separated by the Fixation of some Liquor. This is (as I suppose) the whole Effect of these Preparations; as is evident from what Mr. Boyle and all other *Chymists* have found, to wit, that from all the Transmutations and Preparations of Mercury they could elicit the same uniform heavy Fluid; which could never happen, if there were any other (besides the now mentioned) Effect produced by these Preparations; for by what Means soever you dissolve this congeal'd Separation, the greater Gravity of Mercury brings its Particles into their former Union, and thereby reduces them into the same Fluid, Quicksilver. Besides these two Suppositions, it is to be observ'd,

1. That the chief Ingredients in Mercurial Preparations are (besides it self) Common and Armoniack Salts, and their Spirits; the Spirit and Oil of Nitre; *Virriol*, and its Spirit; and the like; (which afterward we shall call by the general Name of *Saline Bodies*.) all which (we know) are endued with

a vast Power to vellicate and stimulate the more sensible Parts of Animal Bodies, and (consequently) to produce Vomiting and Purging (of themselves) according to their Quantity, and the Degrees of their natural Force.

2. That the only Effect of repeated Sublimations in these Preparations, is the Division of the Mercury into smaller and smaller Particles, and the freeing of these from the grosser and more noxious Parts of these *Saline Bodies*; for Mercury sublimating more quickly and easily than these other *Saline Bodies*, must in repeated Sublimations have a greater Proportion to the *Saline Mixture* than in the first Sublimations; and consequently the subsequent Sublimations must have less of those *Saline Bodies* than the antecedent, whereby the Preparation will become sweeter and less vellicating. This is evident from the *Aquila alba*, & *Panacea Mercurialis*, which are all much heavier (specifically) than any other Preparations of Mercury.

These Things premis'd, I come to explain,

II. The Manner of the Operation of Mercurial Medicines; in performing which, I distinguish two Cases. 1. Either the Medicine is taken inwardly: Or, 2. It is applied outwardly; under which Head I comprehend both Mercurial Inunctions and Plaisterings. As to the first, after the Medicine is taken by the Mouth, it descends into the Stomach, and there the Saline Parts of the Composition vellicate the *Fibres* thereof, which occasion the Gripes are felt upon the taking these Medicines; and if the Saline Particles have a considerable Share in the Composition, they so powerfully stimulate the *Fibres* of the Stomach, as to bring it into these Contractions which produce Vomiting; as has been formerly explain'd. The Mercury it self, with some of the Remainder of the Saline Particles, slipping into the *Intestines*, do likewise vellicate these, and occasion a gentle Purge; which Effect, though it be constant, (in the first Days after taking these Medicines) yet it is never so violent as that of other Purgatives, because most of its Force is spent in the Stomach. Now that both the Vomiting and Purging produced by these Medicines are owing to the Saline

Saline Parts of the Composition, is evident from the Nature of Mercury, and the Effect produced in it by the Chymical Preparations thereof, just now explained; for Mercury consisting of spherical Particles, and by such Preparations being only divided into these, of themselves (as being spherical) these Particles could never occasion the Stimulations, which (as has been formerly shown) are necessary to produce these Effects. The only Thing they can contribute towards them is, that by their excessive Gravity and Smallness they are capable to dissolve the Cohesion of the more viscous Fluids of the *Stomach* and *Intestines*, and consequently make them flow more easily, when the *muscular Fibres* of these Parts are otherwise brought into Contractions. Besides, we see that the fore-mentioned Effects are mostly produced by these Compositions in which most of these *Saline Bodies* enter, as in the Corrosive Sublimate, the White and Yellow Precipitate: But in the others which pass many Sublimations, (as the Sweet Sublimate, and the *Pannacea Mercurialis*) we judge of their Goodness as they produce least of these Effects. I ascribe the Sweating produced by a Dose of some of these Compositions, partly to the Violence of the Vomiting, and partly to the Saline Particles which enter the Composition; and that small Salivation, to the immediate Action of these *Saline Bodies* upon the *Salivary Glands*, and not to the Mercury it self. All these will be evident to any who have seen the sudden Effects of these Medicines, which have not had sufficient Time either to enter or circulate with the Blood, so as to be able to produce the mentioned *Sweating* or *Salivation* after the ordinary Manner. Thus I have endeavoured to explain the Effects of these Medicines while they are in the *Prima Via*. I shall now show the Manner of their Operation in producing a *Flux de Bouche*, that thereby the lesser Effects of this Kind may be understood.

The Mercury being freed (by the Action of the *Stomach*, and the Heat of the Liquors contained in the same and in the *Intestines*) of most of the Saline Part of the Composition, enters the Blood by the *Lacteals*, and is with it carried about through the Canals,

where either it, or any Liquor of the Body generated by it, flows, (the small Remainder of these Saline Particles, which adheres to the Mercury after the Action of the *Stomach* and *Intestines*, assisting the Propagation of the Motion, by the vellicating the Sides of the Canals :) And having the same Celerity, but a much greater Weight, it has consequently a greater Force, and produces a stronger *Ictus*, and thereby (when once any considerable Quantity thereof has enter'd the Blood) it (by its great Force and the Smallness of its Particles) dissolves the unnatural Cohesions of all the Liquors, renders them more fluid and active, and likewise digs out all the Obstructions of the impassable Canals, like so many little Bullets shot against a Mud Wall; every little Bullet breaks down a Part, till the whole be levelled: And this it is the more able to perform, both because it is exceeding weighty, and makes therefore a greater and more forcible *Ictus*, and because its Particles are exceeding small, and are therefore to be consider'd as so many exceeding sharp Wedges or *Cunei*. Besides, by the Smallness of its Particles, it is able to enter into these slender Canals in which the Blood cannot freely pass, and thereby to scour all the Passages, be they never so small. And that there are Canals through which the Globules of the Blood cannot freely pass, we are convinced from Microscopical Experiments. Thus all the Liquors of the Body being attenuated, and consequently their Celerity and Force render'd greater, and all the Canals scoured and render'd passable, the whole *Glands* of the Body are set at work, and throw out the more noxious and less fluid Parts of their Liquors, (by reason the Particles of the Mercury either dissolve or carry before them all the gross Particles which resist them) and thereby the Perspiration, Urine, Salivation, are increas'd, the Quantity of the Fluids lessen'd, and the whole Body emaciated, till there be nothing left but pure and useful Liquors, and clear and passable Canals. Those who can only be convinced by ocular Demonstration, may see a Kind thereof in *Phil. Transf.* for Jan. 1700, where *Leeuwenhoeck*, from Microscopical Experiments on *Tad-poles*, confirms the main of this Doctrine

as to the Manner of the taking away Obstructions.

But there is another Effect of Mercurial Medicines, which is no ways to be forgotten; for besides these mentioned Effects, it destroys that corrosive Faculty of the Liquors, which bursts the superficial Vessels, and produces these constant Pains, Scabs, Ulcers, and the like; which we feel: For, supposing an Obstruction in any Vessel (either by the Corrosiveness or Viscidity of the Liquor, or from some extrinick Cause) the Liquor stagnates and coagulates there, and by the Force of the fluent Part of that Liquor, and by the Corrosiveness of the stagnated Part, the Vessels are miserably distended, and their Parts dilacerated, which occasions constant Pain in that Part, or they burst, and the Liquor putrifying, occasions a Botch, Scab, or Ulcer, more or less dangerous and painful, as the Corrosiveness of the stagnated and putrifying Fluid is greater or lesser. Now this corrosive Faculty must proceed from the Pointedness of the Particles (perhaps these Particles may consist of four equilateral triangled Plains, for such have the greatest equal Degree of Acuteness on all their Points, which seems necessary to make them equable in their Actions, and homogeneous in their Natures) of the stagnated Fluid. Now the Mercury will not only remove the Obstruction, and make the Vessel passable by its Weight, but likewise by the same will break off and plain the Points and Angles of these Particles, and so render them harmless and innocent; for *sublata Causa, &c.*

But here it may be objected, That the grand Effect (as most People believe) of Mercurial Medicines is Salivation, and that really the *Salivary Glands* secrete more of their Fluid proportionally than any other, yea than most other *Glands* of the Body, which is contrary to the 5th *Prop.* about Secretion. To this I answer,

1. That the principal Effect of Mercury, is the attenuating the Fluids, the clearing the Canals, and the destroying the Corrosiveness of the Obstructions; and that Salivation has no more Title to be the principal Effect of Mercury, than insensible Perspiration; for all the *Glands* (notwithstanding

the Objection) secrete their respective Liquors in the Proportion mentioned in the 5th *Prop.* about Secretion. 2. It is evident that Salivation is not the main Effect of Mercury from this, that many Persons are cured of very dangerous Poxes, Ulcers, and Rheumatisms, without ever salivating, at least at the ordinary Rate of Salivation. But, 3. The Reasons why we seem to secrete more by the *Salivary Glands* proportionally than by any or most others, are these: 1. The *Salivary Glands* are more in Number than any of these which separate visible Fluids, and consequently it is but reasonable they should secrete more than any other. It is true, the *Glands* of insensible Perspiration are more in Number than those, and it is not to be doubted but they secrete more likewise; and it will be found so, whenever the Thing is examined after *Sanctorius's* Method; but that Secretion not being visible, makes the Matter doubted. 2. The Canals which constitute the *Glands* of Salivation are evidently wider than these of others, as is clear from their spongy and soft Contexture, and so it is very accountable from the mentioned *Prop.* why they secrete more plentifully. 3. The Fluid secrete'd in the *Salivary Glands* is ropy and viscid, and one Part draws forward another, which does not happen in most other *Glands*; and upon this Account it is no Wonder that those secrete more than these. 4. The *Salivary Glands* in some People have not so good a Contexture, and so obvious a Course, as in others: And this is the Reason why some salivate little or none, and others too much. But, 5. The true Account of the Matter is this: The *Saliva* being a tough ropy Substance, cannot be thrust out so fast as the Mercury carries it forward, especially seeing it separates only the most glutinous Parts of this *Saliva*; whence all the *Salivary Glands* begin to swell, until there be such a Quantity accumulated, as, together with the Force of the Mercury, and of the succeeding Fluid, is able to burst the Orifices of the *Glands*: And it is observable, the Salivation continues only so long as any of the *Glands* are found swell'd: Whence it is evident, that this plentiful Salivation depends upon this, That the Fluid is as it were laid up in Store to be derived
more

more plentifully afterwards; whereas in the other *Glands*, the Fluid being thinner, is secern'd as fast as it is driven forward: And hence it comes to pass, that we think the *Saliva* secern'd is much greater in Quantity than what is derived from the other *Glands*. If we take in all these Considerations together, they will account for the plentiful Salivation by Mercury.

2. As to the second Case: In Mercurial Inunctions, the viscid Matter, in which the Quicksilver is wrought and pounded, serves only to keep the small Particles thereof separated and asunder, and to apply them to the Skin, till by frequent rough Frictions the smallest Particles of the Mercury are forced through the Sides of the cuticular *Arteries* into the Blood, and when once they are got thither, they are in the Estate just now mentioned, and operate after the Manner already explained. And indeed this were the shortest and easiest Course of raising a *Flux de Bouche*, if Mercury could be adjusted to the Strength and Constitution of the Patient (for the Quantity of Mercury, which will kill one, will not produce the design'd Effect of Salivation in another) by this Method, as exactly as by administering it gradually in Doses by the Mouth. But it cannot be done so, and therefore the latter Course is the more safe.

Mercurial Plaisters, applied outwardly to heal Scabs, or inveterate Ulcers, operate thus: The corrosive saline Mixture (if there be any Part thereof in the Composition) eats away and corrodes the putrid Matter, which sears up the Mouths of the Vessels; so that the Mercurial Particles get easily into them, where they both clear the Vessels of the Obstructions, and destroy the Pointedness of the Particles of the Fluid, which two Things did concur to make the Ulcer or Sore. If there be no saline Body in the Application, then the Mercury must be forc'd by Friction into the Mass of the Blood, to produce the design'd Effect.

Thus from a few easy and evident *Posulations*, I have given an intelligible Account of the Manner of the Operation, and of the Effects of Mercurial Medicines, when the Mercury enters in any Quantity into the Mass of the Blood; and from thence it will

be easily understood, that when the Quantity is less, the Effects will be proportionally lesser, so that it will be needless to explain all the several Degrees thereof by Detail. But seeing it is evident from *Leeuwenhoeck's* Observations in the last mentioned *Phil. Transf.* that the Force of the Blood is able to wash away some Obstructions, let us take a gross Estimate of the Proportion of the Efficacy of the Blood assisted by Mercury, to the Efficacy of the Blood of it self and unassisted, to take away Obstructions.

1. Then we must consider, if (instead of the ordinary Liquors) there pass'd nothing but Mercury in the Canals of the Body, the Weight of Blood being to that of Mercury as 1032 to 14593, or as 1 to 13 at least, and their Velocities being the same, Mercury would at least be 13 times more able to remove the Obstruction than the Blood of it self: But it is certain (if the Obstruction renders the Canal impassable) there can no Particle of the Mercury get away; and when there is any Quantity thereof got into the Blood, there are still some new Particles of it coming up, so that after some Time (they having a greater *Momentum* than the *Globules* of the Blood, and thereby getting through it up to the Obstruction) we may consider there will be little or nothing save Mercurial Particles at or near the Obstruction, driven against it by the whole Force of the Blood; so that, as to the Obstruction it self, it is very near the same as if the whole Canals run Mercury. However, let us take the Proportion only as 1 to 10; so that upon this Account the Blood, assisted by any considerable Quantity of Mercury, will be 10 times more able to remove the Obstruction than the Blood unassisted.

2. Let us consider, the *Globules* of the Blood are elastick, (for they often lose their Figure in straight Canals, and recover it again, as *Leeuwenhoeck* has shown, which is the Definition of Elasticity) and these of Mercury are not, or very little so; and consequently upon this Account, the Efficacy of the *Globules* of Blood will be hugely diminish'd. Let us suppose it loses $\frac{1}{4}$ of its Efficacy (which is a liberal Allowance), and then the Proportion will be $\frac{3}{4}$ to 10, or 3 to 40.

3. Let us observe, that the *Globules* of the Blood and Mercury driven against the Obstruction, and at every Pulse digging away a Part of the same, may be consider'd as *Cunei*. Now (*cæteris Paribus*) the Force or Efficacy of *Cunei* is reciprocally proportional to the Angles their Edges make: But in Spheres, the lesser or greater Degree of Curvity is to be consider'd as these Angles, when these Spheres are consider'd as *Cunei*; and the Degrees of Curvity in Spheres (as in Circles) are reciprocally as their *Radii*. Supposing then the Diameter or *Radius* of a Particle of Mercury is to that of a *Globule* of Blood as 1 to 100, (and there can be Reasons given, some of which I have formerly hinted, why the Odds may be suppos'd much greater) then the Force of the Mercury and the Blood, to that of the Blood unassisted, to remove Obstructions, will be as 4000 to 3. Lastly, Let us consider, that by the Force of the Mercury the Liquors of the Body are exceedingly attenuated and render'd more moveable, and are thereby capacitated to receive a stronger Impression, so that they both move more quickly and with greater Force; as is evident from the Pulse of those who are under a *Flux de Bouche*, whose Pulse is little less frequent and strong than the Pulse of those in a Fever. Let us suppose the Proportion, both of the Frequency of their Pulse, and of its Strength, to that of an ordinary one as 3 to 2, (and this is certainly much less than the Truth) then it will be as 3 to 2 upon the Account of its greater Force, and again as 3 to 2 upon the Account of its greater Frequency, that is, as 9 to 4; so that now upon this last, and all the former Accounts, the Proportion of the Efficacy of the Blood, assisted by any considerable Quantity of Mercury, to that of the Blood unassisted, to remove an Obstruction, will be as 36000 to 12, or as 3000 to 1; so that the first will be 3000 times more effectual for that End than the latter. But if any should still think we have made too liberal Allowances for the Mercury, let us rebate the Proportion one third Part; yet still the Blood, assisted by any considerable Quantity of Mercury, will be able to do as much toward the Removal of an Obstruction in one Day,

as the Blood unassisted in three Years almost.

Besides, there are a great many Cases, in which the Blood unassisted is so far from being able to remove the Obstruction, that it will continually increase the same: For if the Obstruction proceed from a Depravation of the Liquors of the Body, as in *Rheumatisms*; or if some corroding Matter be forced into the Liquors, so as to be able to vitiate the same, as in Poxes, Pests and Poisons, it is demonstrable, that (without some external Assistance, either by Diet or Medicines) the Malady, instead of mending by Length of Time, will increase. But if the Obstruction proceeds from some external Injury, as in Bruises, Wounds, Colds, and (perhaps all Continued) Fevers, the Liquors (still persisting in their natural and wholesome State) may do much to drive away the same by Length of Time; but still the sooner, and more safely, if they be assisted by convenient Medicines. I come to,

III. The Advantage and Usefulness of Mercurial Medicines.

And, 1. They are useful for destroying the Viscidity and Thickness, the Corrosiveness and Pointedness, of the Particles of the whole Liquors of the Body, rendering them fluid and moveable, innocent and harmless, if before they were otherwise.

2. They are evidently useful for removing all Obstructions, Ulcers, Scabs, Botches, Swellings, constant Pains, (all which are but the Effects of some Kind of Obstruction or other) of whatever Nature or Kind, by adjusting only their Quantities rightly; but that is the Work of an able Physician.

Now for Answer to the Question which gave Occasion to this Discourse. Mercurial Medicines were exceedingly useful, and would answer the whole Design in curing Fevers, were it not upon these two Accounts: 1. Before they could be effectual for this Purpose, they behoov'd to be administered to a large Quantity, which never misses (by the Violence and Force of the Motion of the Blood thereby occasioned) to induce a new Fever in the Patient of it self; so that instead of curing the former Fever, it would double it, and make the Danger double, which

which by no Means is to be done, the Patient having enough to do to wrestle with one. But, 2. It requires so long Time to bring the Effects of Mercurial Remedies to any Height, that the Patient (in so long a Space) would be cured by the Force of Nature, or kill'd by the Violence of the Disease; so that upon this Account they are render'd useless. Besides, there are a thousand other Inconveniencies which render this Method in its full Force altogether impracticable.

After all, I mind to have been informed (some Time ago) by that Eminent Physician of our Country, (whom I have thrice already mentioned) That People who have been severely flux'd seldom fall into dangerous Fevers; and that in Fevers of Children occasioned by Worms, Mercury (if discreetly us'd) is always, and in some Fevers of People of riper Years is often, very successful; the Reasons of both which are very evident from our Doctrine.

For (in those who have been severely flux'd) the Blood is so purified, and render'd so fluid, and all the Canals are so cleansed and scoured, that if at any Time there should happen such Obstructions as occasion

Fevers, Nature is able in a short Time to drive them away, seeing they must rather happen from some external Cause than from within, where all is clear and passable.

As for Fevers occasion'd by Worms among the Fluids in the Bodies of young Persons, (which by the way is an Argument omitted for our Theory of Continued Fevers, as is likewise the *Febris Variolarum*, both which are occasion'd by Obstructions, as is evident from the Batches which break out upon the latter, and as shall be just now shown of the former;) for here a little Worm being forced into some of the *Capillary Arteries*, where it can neither get back nor forward, totally occludes the Passage of the Blood, and thereby occasions a Fever after the Manner already explained. Now the Reason why the natural Force of the Blood is not able to remove such an Obstruction is, because a living Creature makes it, which will not be moulder'd away after the Manner of coagulated Blood; but will require the greater Weight and Force, the Mercury to kill it first, and then both the Mercury and Blood concurring, wash it away.

An entire History of all the Fluids that are contained in the Humane Body, as Chyle, Milk, the Semen Virile, Pancreatick and Biliary Juices, the Lochia, and other Female Excretions; Scrum, Lympha, the Humour of the Pericardium, Saliva, Tears or the Liquor flowing from the Eyes, the Mucus or Snot of the Nose, Ear-Wax, Urine, Sweat, the Matter of insensible Transpiration; of Spirits called Animal, Succus Nutritius, &c. From Verheyen, Bellini, D'Gagnon, Hecquet, and other Modern Authors: And first of all from Pitcarn's Dissertations.

Of the Circulation of the Blood by the smaller Vessels, a Dissertation published by Archibald Pitcarn, M. D. Professor at Leyden, in the Year 1693.

WE have been hitherto taught by the Divine *Harvey*, that the Blood circulated or was driven from the Heart through the Arteries, and that it return'd thither again by the Veins; and being contented with this Doctrine, which was received as the Faith of a Physician, they have let what remains to be discover'd lie in Darkness. But afterwards when this appear'd not sufficient to answer the Intentions of Physick, Men began to dispute, whether the Blood was poured out from the Arteries into other Parts of the Body, by which the Arteries and Veins might be dispers'd into their opening Trunks; or from the smaller Arteries, that did not convey the gross, but finer Blood, for the Nutrition of the Parts, which did not return again, and all the remaining Blood pass'd by the larger Arteries that were united to the Veins by *Anastomoses*. For, first of all, the great Part of the gross or thick Blood, that is, such as is contained in the larger Vessels, is thrown into the Parts of the Body, or rather the Interstices of the Parts. But, secondly, it

sends the thinner Part of the Blood, that is, the Part inclos'd in the smaller Arteries, said for the Maintenance of the Parts, that is, it teaches a great Part of the Blood not to circulate but in the *Viscera*, as they say, and so to stagnate and adhere to the Pores of the Parts. But when all the Blood is driven round by the Force of the Heart and the Arteries, so that by its Vigour the Blood cannot rest, it is plain there can be no Stagnation in the smaller Vessels; but by the constant Accession of the Blood's Motion, that must be interrupted; or else the Blood not returning by the Veins, they must swell, which does not happen in a healthful Animal; and therefore it appears plain, that there is no Adhesion in the Pores, from the Increase that constantly follows from the same Reason; for by how much the more is pour'd into the Pores, the easier it returns from the shutting up of the Vein from the Fluid that runs around it; as will hereafter be shown.

As Physicians appear greedy of Novelties, so they are too apt to be taken with every Sound;

Sound; and when some have observ'd a certain Kind of glandulous Flesh collected together in several of the *Viscera* surrounded with all Sorts of Vessels, they no longer doubt but that there are Glands in all those, which receive Blood from the Arteries, and transfuse it into the Apertures of the Veins that open betwixt the glandulous Body, whilst that Division secerning a sufficient Part, the Glands let it pass thro' the Vessel. But this Opinion has nothing new in it, or is it of any Use in Physick, but is a meer Sound or Jingle of Words; for hence it only happens that the Gland is call'd that *Medium* which they call'd sometimes the first Parts and Substance of the Body, sometimes the *Anastomoses*, which neither the Arteries or Veins could properly receive the Name of. From hence also arises the same Inconveniency; for when by this Means the Arteries and Veins were appointed to open into the Cavity of the Gland, a Part of the Blood only can be swallow'd up from the Vein; the rest will be partly excern'd, and partly remain for the Increase and Nutrition of the Parts, which will appear opposite to the Circulation, and be shown hereafter to be false.

And since it is manifest, we ought to be of that Opinion from whence may be drawn the best Conclusions that may conduce to the Use of Life, and not such as will furnish us with the best Subject for Disputation; therefore what Physicians have writ in their Books concerning the Use of Circulation in the Art of Physick is chiefly to be regarded. In those Books, many of them show that they believ'd the Blood often flow'd from the Mouths of the Hamorrhoids, Mesaraick, and other Veins; which they cannot believe, who understand that the Blood always tends to the Heart from the Extremities of the Veins. But all Physicians that have laid down any Method, although they have believ'd the Circulation of the Blood, have with one Consent agreed and taught, that the Blood stop'd in the Parts or the Glands; and because the Blood, whether grosser or finer, being detain'd in the Interstices of the Parts, produced the same Symptoms which the Ancients allow'd, who were ignorant of Circulation; therefore the same Method of Cure propos'd by

the Moderns is plainly agreeable to that of the Ancients, although never so dissonant to Experience, and the Laws of Circulation; from whence it is not to be admired that there is no greater Alteration in the Practice of Physick, since most Diseases take their Rise from a vitiated Circulation in the minuter Vessels, which most of the Moderns seem to have understood no better than *Hippocrates* and *Galen*.

But although many Fluids are taken from the Blood, which are not restored to it again, and therefore not said to be circulated; yet some Motion of them is necessarily conjoin'd with the Circulation of the Blood, so that they stop. This is either suddenly, or by Degrees, extinguish'd; for which Reason all Fluids which are driven from the Blood preserve some constant Motion, although it be slow, towards the same Parts, as if press'd or squeez'd from the first flowing Blood towards them; from whence it follows, that those who attribute no Motion, or at most only into some Parts, to the Fluids secreted from the Blood, either do not allow, or at least do not understand, the Circulation of the Blood. Nor is it to be wonder'd at that some Physicians join with the Ancients, and though they allow Circulation, yet have not freed the Art from their Errors; for the Circulation of the Blood is not more necessary for the Conservation of Life, than the Secretion of several Fluids therefrom, and the casting of them into several Parts, the vicious Increase or Diminution of which Secretion is the great Cause from whence most Diseases are derived; so that he that is in this Affair of the same Opinion with the Ancients, might as well think he can establish Physick better by being ignorant of all the Effects of Circulation. There are a great many who have not believ'd *Harvey's* Demonstration, among whom *Willis* was eminent, who endeavour'd to try, if, by the Fame of his Learning, and the Praise of Philosophy, he could overthrow the very Foundation of the Art of Physick; for his Books contain nothing but old Notions wrap'd up in new Terms; and whatever he boasts, he endeavours to throw the Blood into every Part in an irregular or straggling Way, and especially the nervous Liquor, which wanders backwards and forwards

forwards as it pleaseth. Thus we may see in his *Pathology* of the Brain, Convulsive Diseases, and *Pharmacentia rationalis*, the Animal Spirits, in the *Vertigo*, *Epilepsy*, and convulsive Motions, coming out or issuing by the Pores and Interstices backwards and forwards, as if he was forgetful of, or slighted, the Structure of the Brain, and the Laws of Circulation. In some other Diseases, the Animal Spirits were drowsy, and naturally inclined to Sleeping. Sometimes he assigns Perception to them, and always what was contrary to the Circulation of Liquors in an Animal.

But to avoid these Errors, some of the more sagacious Physicians would have it, that all the Blood is percolated through the Glands, and Part of it returns into the Veins, the Remainder is sent away into a secreting Vessel out of the Glands. And some others, that they might propose a safe Way, have form'd to themselves several Roads of passing it off. Those who magnify the chymical Art, assign to every Gland a certain Liquor, which is wonderful in its Operation, under the Name of a Ferment; that is, some Fluid Parts that subside from the first made Blood into Places agreeable to their Texture, in which, to wit, by a hidden Power or Virtue, that is, they are supported by their own Congruity. The Force of this Ferment is such, that the Blood, or Part of it, is chang'd into a Fluid of another Texture, such as is observed to be produced from that Gland, or the like Congeries of Glands: So, for Example, Part of the Blood brought to the Glands of the Liver, by an epatick Energy, and from an innate Ferment, lodg'd in the Glands of the Liver, is soon taught to change into meer Bile. This Opinion obliges the fermenting Liquors to adhere to some of the Parts, and therefore allows no Circulation of the fermented Mass.

Yet those are to be wonder'd at who can believe, that the Business of Secretion can be performed only by the Help of Ferments; for tho' that Opinion may not be contrary to the Circulation of the Blood, that admits that all Liquids contained in the Animal are either mov'd round or in some direct Motion, and that no Rest or Stagnation is allowed to any Fluid; yet, besides the Force of the Ferment, other Things are to be admitted to

establish Secretion, that is, to preserve or maintain the Circulation of the Blood; which yet further demonstrates the Utility and Impossibility of Ferment, as will be presently shewn. But those who embrace this Opinion, tho' they acknowledge the Circulation of the Blood in Words, yet they deny it in Effect.

They are refuted after the same Manner, who assign the Bile to be secreted in the Kernels of the Liver: We see the Sediment of the Urine cannot adjoin it self to the Glands of the Liver; as, for Example, Filtering once dip'd in Oil will not give Passage to Water, or being first dip'd in Water will not let Oil pass through it.

And though those chymical Ferments are not to be despised, yet the mechanical and philosophical Opinions lately received are more consonant to Reason, and assist us better to explain the Nature of secreting that Fluid called Blood; since it is granted by all, that Animal Blood is composed of many mix'd Fluids, and that every one of those Fluids are formed of similar or like Particles, if homogeneous, but yet of a different Figure or Size; but if heterogeneous, the Mass includes Particles of various Figures and Sizes: And all this Business is illustrated in the Example of a *Sieve*, that lets through it one Kind of Grain or Seed, and will not let another pass, though less, because of another Figure; and also by that of a Colander or Strainer, that is pervious to some Fluids, and denies Passage to others much thinner.

Since then we are composed of Canals of divers Kinds, carrying various Sorts of Liquors in them, these Canals are made of certain and determinate Fibres, of such a Number, compos'd of such Tunicles, have such Compactness, Elasticity and Figure, and are of divers Proportions, from whence they receive different Names, as Arteries, Veins, Nerves, Fibres, Vesicles, Lympheducts, Bones, and Liquors of a like Determination, whole Parts have such a Degree of Fluidity, that they can easily be turn'd about, and with small Force mutually move and be removed by one another.

He that diligently considers how great a Part of our Blood is more subtil, or rather more fluid, than Water; I need not say watery indeed, tho' Water, or whatever is

of an aqueous Fluidity and Weight, can easily be rarefy'd by a moderate Heat, be dispers'd into the minutest Parts: Or if any look but into the Nature of a Fluid, he ought not rashly to deny, that the Blood flowing through our Vessels can be, by the Force of the Heart's Motion, driven and divided into much lesser Parts, tho' it be a Fluid of the same Nature, and perhaps composed of other heterogeneous Fluids; but he ought to think that every Fluid is made up of an infinite Smallness of Parts, which yet in one Fluid and another has a different Force; so that they are not the smallest Solids of the Fluids that are secern'd in the Vessels and Glands, (for we do not think there is any such forcible Motion derived from the Heart and Arteries, that it can separate the smallest Parts that compose the smallest Fluid from all Commerce with the rest, otherwise we might observe the most volatile Salts freely discharged thro' the largest Arteries before the Blood) but the very Fluid it self, tho' sometimes in a small Portion. And it is evident the Fluids do not take upon them any one proper and constant Figure, since they accommodate themselves to every Figure, and enter any Orifice; from whence it follows, that if the Fluids are secern'd from Animal Blood in a fluid State, there is no Need for a particular Figure of the Orifice receiving it, but every one suffices that is sufficiently large, neither are the Figures of the smallest Parts of the Fluid of any Moment towards the performing of Secretion.

But they are not the Fluids that are secern'd in the Glands from the Fluid Blood, but the least Solids that are agglomerated or mass'd together again, and form the smallest Vessels, being secern'd in the Parts, make up the collected Bodies into a large Fluid. We ought to see what must be allowed to do this; namely, it ought to be remark'd, that in the discerning Vessels, the Mouth of the given or proposed Figure may receive, and also admit, a Corpuscle of a given Figure. It ought to be allowed, that the proposed Corpuscles, and the Section of the collected Body to the proposed Orifice, by a plain Parallel from the Orifice, be like and equal to the Figure of the given Orifice; to wit, that if a triangular Orifice

only receive a solid Cone, the Triangle ought by the Axis of the given Cone to be like and equal to the Triangle comprehending the given Orifice; and that a quadrate Orifice: Admit only that of Salt for Example, the Cubick Particle ought not to be broader than that of the Cube, but equal to the Orifice; but that an Orifice that is a Parallelogram admits only a Body of a prismatick Figure, it is required, not only that the Breadth of the Prism be no bigger than the given Orifice, but that it be equal and like to it; for if the Body received be less than the Orifice, then not only this Body, but an infinite Number of others, of various Figures, may enter the Orifice with it. And so much for the Necessity and Use of Pores of various Figures.

The Canals and Liquors of all Men have the same common Properties; but if, for Example, the Blood of all Men were compounded of equal Parts, equally smooth, round, or the like, then all Men would be of the same Temperament, and all equally alike healthful. We may suppose them similar, as to the Vessels; but not as to the Liquors contained in them. Hence it is, one is more adapted to this Kind of Action, this to another; one more disposed to this Kind of Disease, another to another Sort; and these Properties are called Temperaments: Thus it follows, that all Men are govern'd by some of these, from whence they may date their Cause of Sickness, or their Defection of Health, which may not improperly be called the Rise or Origine of a Disease. Thus the ancient Physicians assigned Four Temperaments, but they were ignorant of the various Motions of the Fluids, and the several Secretions made from thence, by which we can better account for the Disorders in the Animal Oeconomy, when we consider the Motions of the Fluid, whether circular or intestine.

The radical Heat and Motion of the Parts I take to be maintained and continued by the Attrition of the Particles of the Blood, which is produc'd from the first Spring of Vital Air, inspired *ab Origine*, and propagated by the Assistance of the Lungs, which never cease to supply the Fluid with that *Pebulum* which is immediately convey'd into the Arteries, where it continually divides

the Particles of Blood, expands it self, and so raises that Motion which propels the Blood with such an *Impetus* as has been vainly assigned to an impulsive Faculty in the Heart; for by the great Resistance of the *Pondus* of the unactive Fluid, the elastic Spring of the Air forces it in a progressive Motion, being continually driven forwards into the Arteries by the Inspiration of the Lungs, and Compression of the Diaphragm.

To explain this, we must consider, that the solid Parts are fabricated from that by which they are afterwards nourish'd, and receive their Augmentation; for since Nutrition and Increase is the Apposition of the Parts, it ought to consist of such like Matter as is sufficient for the growing Parts and their Increase, and which may afford a Rise for Parts to spring from them; and so the Blood that is the Liquor contained in the Veins and Arteries suffices for an Increase to the Parts, and therefore gives Rise to those, and from that the common Properties to the Blood and solid Parts, amongst which Heat is to be reckon'd: Therefore the solid Parts receive Heat from the Fluids; I say Heat from the Fluids, which constantly supply them with Heat and Motion.

For the homogeneous Blood that excites Heat by Expansion, and the endeavouring to set it self at Liberty, is agitated by nothing else than the Attrition of the Parts produc'd by the *Impetus* of the Air's Elasticity, which is proportionable to the Velocity of its Emission into the Blood, and the Reaction or Resistance of the Arteries and the antecedent Blood which follows: If that Resistance be not altered by the Change of its Force, and the Velocity impreis'd from the Heart, the Effects will be proportionable to the Heat, and that Heat to the Motion of the Blood.

From hence after the same Manner is explain'd, that if that Swiftnefs of Motion impreis'd from the Heart (by means of Air sent thither from the Lungs) be equal, no Change can happen from the Heat of the Blood, but from the different Resistance and Reaction of the Arteries and the preceding Blood. But the Resistance and Weight of the preceding Blood is proportionable to its own Weight, and that is proportioned ac-

cording to its Nearness to the Heart; for by how much it is nearer to the Heart, by so much the Weight of the Blood is greater that is contained betwixt the Place receiving and the Extremity of the Artery; and the Resistance of the Artery is also much the greater, by how much nearer its Approach is to the Heart, since the Resistance in this Case is agreeable to the Quickness and Swiftnefs of the Motion, and that Quickness so much the greater, by as much as it is nearer to the Heart.

But it will be worth while to examine the Opinion of some of the Moderns, who will needs have innate Heat to be an Effect of the Fermentation of the Blood, brought in by the subtil Matter; and preserved by its perpetual Action: So many eminent Men assign the Cause of Heat in the Blood to the Action of the subtil Matter, since they find not in the Blood any right-lin'd Pores answering to that Motion propagated by even Lines variously exagitated, and endeavouring to unite the Parts of the Blood, and the intestine Motion quicken'd up in that which differs little from Heat.

'Tis evident, those Philosophers suppose the subtil Matter to be reflected from the Parts of the Blood; for the strait-lin'd or rectilinear Pores, if not to be found in the Blood, ought at least to be distinguish'd in the Meeting of the Parts of the Blood betwixt one Extremity of a Pore and the other, (which may truly be called a Canal) which Parts comprehend Pores that are not sufficiently large. But if this be supposed the Cause of Heat and Fermentation in the Blood, when extravasated into the *Pelvis*, and there confined; for Example, that then the Spirits grow hot and ferment, it is quite otherwise; for Blood extravasated, is so far from being exagitated by the subtil Matter, or intestine Motion, that it entirely loses that supposed Heat and Fermentation.

For as Air confined in the Intervals of two Marbles adhering together, and closed on every Side, is hindered in its Action, lest the adhering Parts by Turns should separate; therefore, tho' we grant the subtil Matter Existence, yet those Parts united together will detain the Spirits in Contiguity; and if it be admitted, a Continuance amongst the Pores from one Side of the Portion of that

that Portion of Matter, to the contrary Side of that Portion, or at least to that Portion next contiguous to it. For that Reason, that Part will be held in *Equilibrium*, nor can it be moved in its Place: From whence there is no original Cause for intestine Motion, or Heat, or Fermentation, to be expected from the subtil Matter.

If there was any Gravity in this subtil Matter, that it could cause a Change or Alteration in the Air; but since this subtil Matter admits of no Gravity, there is nothing to be hop'd from it, because it is not heavier in one Place or Time than in another, it compressing all Bodies with an equal Force, in all Times and in all Places, and therefore cannot be the Author or Cause of any Change or Fermentation.

But if there be no such subtil Matter, as *Cartesius* fancied, as it is certain there is not, then there is no intestine Motion, or any Fermentation in the Blood; which is manifest from the Nature of Fermentation, which is properly the reciprocal Action of an Alkali with an Acid. In every fermentative Liquor there is a burning Spirit, but Blood affords not any burning Spirit, but what is only urinous; from whence we may judge the Fermentation to be wanting in that Fluid. For in the Trials of vegetable Juices we find, that before, or with, Fermentation, they afford nothing but Oil and Phlegm; but if the same Juices be fermented, they will allow us a burning Spirit, and but little, if any, Oil. Such is the *Ætherial Spirit* of Wine: For, by the Fermentation, the acid and alkalious Particles mutually unite the Oil and Phlegm into one Body, which becomes a Spirit; hence it is those Spirits become inflammable.

If you take a burning vegetable Spirit, highly rectified, and add to it a Quantity of Water, let it stand a Month in an open Vessel, and you shall perceive the Oil swimming at the Top, and separated from the Phlegm, but the Spirit perish'd, as you may discover by your Taste. This Truth is easily confirm'd, and that there is no Fermentation in the Blood, which is a mutual Action of Acid and Alkali; but where either of these is wanting, as the Acid is in humane Blood, a true Fermentation cannot arise; and that there is none in the Blood, will be manifest

to those who will take the Pains to explore that Liquor.

I understand a Fluid to be that Body, whose Parts yield to every Force that is brought in, and by yielding are easily moved amongst themselves. This Definition agrees with that Hypothesis of *Archimedes*, who assigns that to be the Nature of the humid or fluid Body, that the Parts of it lying equally to a lesser Pressure, is expell'd by the greater. For this Hypothesis plainly asserts, that the Parts less press'd yield the greater Pressure of the Fluid; that the lesser Parts press'd are at Rest in respect of the greater Force that presses 'em, for the lesser Motion has some Rest in respect of the greater; the fluid Parts resting, yield to every Mover. From these Things it follows, that if any Fluid be equally press'd on all Sides, (speaking of a particular Fluid, since the humane Body, and all those Liquors contained in it, are on all Sides equally press'd by the Air and other circumambient Fluids) then all the Parts of it are equally press'd, and at Rest, without any Motion amongst themselves.

Supposing any Fluid in a Spherical Vessel uniformly and equally press'd in it from all Sides, if any Part of it begin to move, all the Parts in like Manner will do the same, and they will move in the same Distance they were placed from the Center; because we may well suppose, that the Fluid, or all the Parts of it, were equally press'd, and the containing Vessel immovable; and where the Equality of all the Parts are in the same Distance from the Center of the Sphere, they are moved either towards the Circumference, or kept in the same Distance from the Center: They are moved into any Part, either East or West. But when we suppose the Fluid homogeneous, all the Parts of it are alike equally heavy, or equally light, therefore have the same equal Tendence, either to the Center, or the Circumference.

If the Fluid be not homogeneous, all the ponderous Parts descend to that Center towards which they gravitate, the rest equally heavy keep the same Distance from the Center as before, and are therefore at Rest in themselves, as *Archimedes* demonstrates, and shews in the same Doctrine, that all the Parts of Water, for Example, (that we may speak of that Fluid, since the Property and Laws

of all Fluids are universally the same) consisting and being equally in the same due Poize or Ballance; so that there is no proper Center for one Part in the Earth than another, in the same Superficies of the Sphere laid by a Right-line to the Center, all are equal: And since it is the same in every Surface of the Water, it is certainly manifest, That no Part of the Water (as it is uniformly fluid) can come nearer, or recede farther, from the Center of the Earth; and therefore the Parts of the Water are immovable in themselves.

From hence I infer, there is no intestine Motion of the Parts, and so no Fermentation, according to that Sense of Dr. Willis, who defin'd Fermentation to be *Motus Intestinus Particularium Corpus Componentium*; and there are others that after the same Manner confound Fermentation with intestine Motion.

Since I have already taken the Liberty to wander beyond the Design of this Tract, I shall indulge my self a little farther to explain the Animal Oeconomy. And First,

The Meat chew'd by the Teeth, and mix'd with the *Saliva*, that it may the more easily be ground and yield to a farther Impression, is made moist by thrusting into the Stomach, in which Place, by the Help of the perpetual Motion perform'd by the Tunicle of the Stomach, and the Muscles which assist in Respiration, in which the *Diaphragm* presses the Stomach to and again by Turns, the Parts of the Food, with the *Saliva*, and the serous-Liquors of the Glands, are made soft, broken in Pieces, wasted, and divided into lesser Parts, till they become so small as is requisite for Fluidity: From these, together with the Liquors of the Glands, and the Drink received, are form'd what we call Chyle.

So that the Parts of the Aliment are not dissolv'd by any intestine Ferment, and innate Force of the Stomach, into essential Parts, as they call 'em, and Elements, whether Chymical or others, by any Separation of any Things of a different Kind first united, and the Union of other Parts that were first separated, as it is in every Fermentation. For Example, Wine, in which the Tartarous Parts, first united, are separated; and the Parts separated of the Phlegm and Oil

are properly united, and compound a true Spirit by Concoction; as it is in the Stomach, the Eatables are broken into more intire Parts, like those of the Blood, but those much less, in like Manner as Coral ground on a Marble with Water is broken and reduced into an impalpable Powder, whose Parts are small Corals, and not the Principles of Coral dissolv'd from its Union.

For Proof of this, there appears to be no Need of any other Argument, than that in the Stomachs and Intestines of larger Fish, who devour and digest the less, the Chyle is nothing else but that Liquor swimming with the Fibrils of the Flesh of the devoured Fish, or the smaller Part of Fibres, which differ not from the larger but in Size, as a Microscope will inform us.

Chyle so elaborated in the Stomach, is expell'd thence into the Guts by the alternate Motions of the Stomach, from the Help of the assisting Muscles, in whose first Passage it is diluted with the Liquor of the Gall, and the pancreatick Serum; which Liquors produce no Effervescence, either from the Chyle, or mutually with each other, but placidly and quietly are intermix'd: But by the Help of those Liquors a greater Fluidity is given to the Chyle, from whence it happens that the Parts of the Aliment are so dissolv'd by the Motion of the Stomach; but in Defect of a sufficient Proportion of Liquid, there is not a sufficient Division, and some Parts lie hard upon others, but at length they obtain a larger Space in the expanded Fluid, that they may the more easily move themselves and be moved, and the lesser be extricated from the greater; and since these greater Parts, or the less concocted, cannot, by reason of their Magnitude, be squeezed in great Number into the Chyliferous Vessels, they are thrust through the Length of the Guts, and putrefy there.

Hence it follows, there is a quicker and better Digestion perform'd in the Day-time, and while we wake, than in the Night when we sleep; because when we wake we oftner respire, and so exercise the *Diaphragm*, the Muscles of the *Abdomen*, and the whole Body, more, and so oftner compress the Ventricle.

Likewise, while we gently walk, or use moderate Exercise, we more perfectly and sooner

sooner digest our Food, than by a sedentary and an unactive Life, when we seldom move the Spirits and contract the Muscles. So in Winter we have a better Digestion than in Summer, because the Sense of Cold compells us to exercise the Body with a quicker Motion.

But that Ferment of the Stomach which is either *Saliva* or the *Serum*, issuing from the Glands of the Stomach, contributes no farther to the Digestion of the Food, than that they mollify and render it easier for Dissolution; neither do these Liquors flow into the Stomach to further the Concoction, but as the Motion of the Teeth, *Oesophagus* and *Stomach*, effect it, by expressing those Liquors that then flow to it. For it is evident those Liquors alone do not perform Digestion, because if you mix them in any Place equally as hot or hotter than the Stomach with Flesh or Herbs, they will never turn it into Chyle, but remain unmoved. That it is a Wonder why a Faculty of converting the solid Food into a chyliferous Liquor should be ascrib'd to the Serum of the Blood, which is only excern'd from the Glands, when the Serum evidently is not the *Menstruum* for dissolving Bread, Flesh, or Herbs.

But all this Business will be better understood by Mr. Boyle's digesting Machine, in which there is no Need of Fermentation, but of Heat, and the Pressure of the Air rarefy'd, and not finding a Passage out, dissolves Bones and Flesh, with the Addition of a little Water, into a perfect Gelly, which wants little of the Nature of Chyle.

We have affirm'd Chylification to be a Communication of the Parts of Food, by the Motion of the Stomach, and the adjacent Parts; and by the same Reason we may say Sanguification is perform'd by the Mixture of the Parts of Chyle, by the Motion of the Blood and the Arteries, and the Compression of the Lungs, by which it comes to pass, that the Parts of Chyle, and the Parts of the Blood, being equally small and equally smooth, they may easily slide one upon another, and so flow together, so that the Liquid may become homogeneous in the Canals, from whence, towards this Sanguification, we need not assign any Ferment in the Heart or other Parts.

But all the Parts of the Body are nourish'd from Blood, or that which is secreted from it, which is not the red gramous Part of the Blood, but the white and serous, from which is fabricated the Bones and all the solid Parts, which receive their Nourishment and Increase from that Fluid, which, after its Separation, becomes heterogeneous to the Blood. After the Chyle is mix'd with the Blood by the known Ways agreed on, we shall proceed to explain the Business of Respiration.

It is plain by many Trials, that the Air is ponderous, and that the Air is a Fluid; therefore, from the Nature of a Fluid, Air breaks into whatever Place is more empty, or in which it finds a less Pressure and Resistance than that is which it suffered from the other Parts of Air which press'd upon it before; therefore at the first Birth the *Larynx* will be fill'd with Air, from whence the Gravity of the external Air is removed from the internal, or it would be of equal Weight betwixt the external and internal Air; and then at first the Muscles dilating, the Breast could not come to Action, before the Air had broke into the Cavity of the Breast. The external Surface of the Breast will be press'd with the Weight of Air equal to the Weight of Mercury, of twenty four or twenty eight Foot high, having the same Height with the Breast, the Muscles dilating the Breast could not be puff'd up, and so contract from that Pressure; and therefore the Breast could not be dilated, but removing that Quantity of Air which made up an Equilibrium with the external, the least Force would raise up the Muscles, serving for Inspiration: But the Air cannot gain Admittance into the Lungs but by the *Affera Arteria*, by whose Ramifications it ought to be dispers'd into all the Lobes of the Lungs, and the Bladders that form those Lobes; since it is press'd by the Weight of the Parts, and the Gravity of the Air that lies upon it, even to the utmost Extremity of the empty Space of those Vesicles; and this Action or Series of Actions we call *Inspiration*.

As the Air is the Cause of Respiration and Inspiration, so likewise is it of the Dilatation and Contraction of the Arteries;

for

for the Arteries being fill'd with Blood, the Trusion of the Air with such a Force from the Action of the Muscles in Respiration, propels the Blood forwards towards the Extremities of the Arteries; and after that violent Dilatation succeeds Contraction or a Systole; and from hence comes what we now call the Pulse. But because there are many Differences of Pulses observ'd, from whence Diseases and their Alterations are used to succeed, therefore I will give a short Explication of some more particular Distinctions.

When an Artery is dilated beyond the usual Bounds of its accustomed Dilatation, we call it a great or vehement Pulse; but if the Dilatation of the Artery be not so large as usual, it is call'd a small or weak Pulse.

But if betwixt two Dilations it intercepts a longer Time than it is wont to do, it is called a slow Pulse; but if the Dilatation intercepts a short Time, it is called a quick Pulse.

Lastly, If the Tunicle of the Artery, from some Cause or other, be harder than usual, it is called a hard Pulse; but if by a contrary Cause it be softer, then it is term'd a soft Pulse. Therefore it may be of Use to know the Difference of Pulses distinguishable by the Touch, which are three; great and small, quick and slow, hard and soft: Some others there are, but more insensible to the Fingers. Some Dilatations may be so small, that we cannot discern with all the Assistance our Fingers can give us in the touching them: Hence an unequal and intermitting Pulse may be only a Species of a quick and a slow Pulse.

Let us come to the Consideration of the Blood, not only in the naked Arteries, but as it is distributed into the *Viscera* and Glands, in which Places different Liquors are separated from it: In the *Liver*, *Pancreas*, *Cuticular Glands*, and others almost innumerable Places, discovered and explained by the Industry of *Anatomists*.

That Portion of the Liquid contained in the Arteries, and which enters into the minutest Branches thereof, consists of two Kinds: Part of it is more movable, and deserves to be called a Spirit; but the other Part is more viscous, and adglutinated by

Heat, in respect of the active and volatile Parts, which procure a greater Fluidity; and from hence the Brain is supplied with all those fine subtil Fluids which are distributed in Plenty through all the minute *Ramula* of the *Cerebrum*, and by the elastic Spring of which the Trunk of the Vessel is shak'd with a Concussion more than usual, and so the Liquid falls and presses from the Trunk in a greater Quantity into all its lesser Ramifications.

From that Liquid that flows in the Brain, we shall descend to that which flows into the Chamberpot, which we call Urine, and which is separated from the more homogeneous Fluid of the Blood by the Strainer of the Kidneys, through which the saline Particles, precipitating with themselves a Portion of the earthy Dregs, pass away with the superfluous Stream of Water; for the Texture of the Blood being broken by the Configuration of those heterogeneous Particles, they are separated and left behind in the *Pelvis* of the Kidneys, as unapt to continue the Union of the flowing Mass, not being equally smooth and lubricous, or equally light or ponderous, to make and intimate Mixture, and glide along with the remaining Fluid.

Upon all the Experiments to be made on Urine, it will be found to contain nothing but common Salt and Earth. For if you take a Quantity of that Liquor, and evaporate off the Humidity in a Sand-heat, till the *Faces* be of the Consistence of Honey; then throw on the Residue as much fresh Elementary Water as was exhal'd; and this new Addition, by the Help of a small Digestion, shall become as perfect an urinous Liquor as it was at first when emitted from the Bladder, and so it shall continue after several the like Repetitions.

The Use of the *Testes*, I think, is disputed by none; namely, That they elaborate the *Semen Virile*; but that they give the perfect Form and Figure to the succeeding *Embryo*, from a true and mature *Semen*, is not so well understood.

In the natural Mechanism of every specific Generation, there is a particular Direction and Tendency in all the Parts that compose that Machine to propagate its like.

There-

Therefore Man, who is the perfectest Being of the Animal Creation, and who was brought into the World replete with all the Materials necessary to propagate a perpetual Generation of Creatures like himself, must needs have the whole Form and Figure of his Species contain'd within himself, and therefore still existent in his Nature, and so of Consequence must have proper Parts form'd for the actuating and bringing to Life such latent Embrio's, as afterwards receive their Growth and Increase from proper Matrixes, from whence they are nourish'd by the same Kind of univocal Heat and Aliment as at first they were form'd. For we need not perplex our selves with the Learned *Harvey* and others, whether the Brain or Heart receiv'd the first Formation, since all are equally form'd together, though perhaps some Parts disproportionable to the rest may receive a great Addition of Growth in their Infancy, the whole Frame at first being in a State of Fluidity, some of the Parts become more conspicuous than others; which has deceiv'd many curious Inquirers hitherto. But the many Observations that are daily made, and which admit of farther Tryals, will inform us, that there are many Parts in Infants that are very large in that State, and afterwards dwindle away to almost nothing; and many others which in Infants are not visible, but in Adults appear of absolute Necessity to the Body.

In our Observations upon the *Testes* of adult Persons, we may consider the Formation and Constitution of the Parts, whose curious Contexture seems to be design'd after a wonderful Mechanism for the Configuration of that Liquor call'd the *Semen Virile*, whose Texture is entirely form'd and modell'd from the *Testes*: For in a *Gonorrhoea* you may observe, by the Help of a Microscope, that the Texture of the Parts are broken, the Union resolv'd, and the Nature of that Fluid absolutely destroy'd by the Intromission of those heterogeneous Particles.

After all that has been said by the Ancients, and the blind Assent that many of the Moderns give to their Authority, it will be something singular, and look'd upon as a bold Assertion, to affirm, that Women are of a hotter Constitution than Men.

But this will not appear so strange, when

we shall examine and find, that Women have abundantly more Blood, proportionable to their Size, than Men have; tho' it must be acknowledg'd, they are more humid, and Men more dry. So Infants have much more humid *Serum* in them than young Persons, yet they are much hotter; as any one may be satisfy'd in, that will please to make Tryals either of the Blood or Urine of Children, and compare it with that of Adults; and they will soon confess this Truth, that Infants are hotter than young Persons, and they much hotter than such as are grown to a full Age: And we must grant, that Women, as well as young Men and Children, are more lax and soft; and that from their greater Abundance of Lymphatick Juices, they sooner come to their full Growth and Maturity than Men. The *Lunar* or Monthly Courses demonstrate to us, that they have more Heat, as well as more Blood, than Men; for whether we assign the Cause of that Evacuation to an Ebullition or Fermentation in the Blood, or from too great a Quantity of Fluid, which we call a *Plethora*, it will be equally reasonable to conclude, that Women have more Heat in them than Men, which is not maintain'd by preternatural Disturbances in the Mass of Fluids, but by a constant regular Course of Nature.

If we enquire strictly into the first Origine of Blood, we shall find it in its Infancy to be pellucid, not to have any Thing of Redneis in it; that red Colour being the Effect of a Progress of Digestion, and Mixture of Parts, by the Addition of Heat, which is maintain'd and increas'd by the Reception of Air, that is dismiss'd, and passes through the Pores by Respiration; and we may observe, how Heat is continued by Incubation in Oviparous, or the Heat of the Womb in Viviparous, Animals. So the *Cicatricula* of the Egg, which by actual Heat of the Hen becomes in a short Time of a red Colour; nay, the Heat of Horse or Pidgeon's Dung will soon produce that Variation of Colour. But it is not the grumous and red Part of the Blood, but the pellucid and serous only, which becomes nutritious; for the grumous (when separated) cannot be computed at above a fifth Part of the whole Mass; so that if the solid

Parts were only to receive their Nourishment and Increase from that, all the other must be reckon'd excrementitious. But Observations, and the Tryals made on that Fluid, will inform us, that the grumous Part of the Blood, by reason of its fibrous and agglutinating Particles, is less qualified for the Nutrition of the Solids of the Body, and for the Separation that is perform'd in the Glands, but rather fitted to continue and maintain Heat and Motion in the Vessels; whilst the *Serum*, consisting of watry Parts, though it abounds equally replenish'd with Spirits and volatile Salts in Proportion to its Quantity, becomes a more proper nutritious Juice than the grumous Part of the Blood can be admitted, because that has a third Part more of fix'd Salt and Crassament of Earth in it than the *Serum* has: And it is from this Fluid we must account for the vast Quantity of Matter which is daily thrown off by insensible Perspiration, as *Sanctorius* has judiciously observ'd in his *Medical Statics*.

And we have not only this great Man's Word for it; but this is generally confirm'd by the Observation of the modern Practitioners, who begin to find the great Use of promoting or obstructing Perspiration in the Cure of many Diseases, of which we have an accurate Dissertation of the Learned Dr. *Coles*; and tho' there may be as yet many different Opinions *de Modo & peragenda Ratione*, yet as many as will give themselves Liberty to reflect and consider the Reasonableness of the Doctrine of Perspiration, will no doubt soon be brought to acknowledge the many Uses and Advantages that Inquiry may be of, to the Practice of Physick, and to the more certain Knowledge and easier Cure of Diseases; since common Observation will convince so many of the Reasonableness of such a Perspiration as *Sanctorius* asserts, when we shall consider the innumerable Apertures of the Glands distributed through the whole Contexture of the Skin, by which that Fluid we call *Serum* is constantly exhaling, by Means of the Rarefaction proceeding from the natural Heat of the Body, which dispos'd it to such a Motion; for we must acknowledge, that subtle Vapour, which insensibly passes away, is produced from an universal Heat of the

Parts, which attenuates the more viscous Particles of the Fluid to such a Fineness, as to be able to pass under the Form of the most subtle *Effluvia*, which easily pervade the minutest Vessels of the cuticular Glands, and is perform'd from that Power in Nature, which is nothing else but Heat it self, which the Motion of the Parts, whether internal or external, excites, and diffuses from the Center or vital Flame to the Circumference.

For this *Flamma* or actual Heat within us is maintain'd and continu'd by the constant Addition of nitro-aerious Particles which we daily inspire, and which is the Author and Enginier, the peculiar Intendant of the Functions ascrib'd to the Animal Oeconomy. This is that which buoys up and supports this curious Fabrick, and which still sustains and preserves his Being. This is the Fountain and Original of Life; yea, even Life it self. And we cannot but observe, that Perspiration is the peculiar Effect and necessary Consequent of Inspiration: Nay, by this Way of Perspiration is shown the most eminent Specimen of the Creator's Wisdom: If we contemplate it aright, we shall find nothing more beautiful, nothing more admirable.

By this Method, there is no Need of Sphincter Muscles, or any Compression of the Parts, no Vibration or Constriction, no Need of an impulsive or expulsive Faculty, or any Occasion for transverse Fibres; the fix'd and less watry Humours being attenuated or divided into finer Parts by the Rarefaction that the subtle Particles of the Air procure in the grosser Fluid, by the Intromission of those new Bodies which raise and support the *Flamma*, which soon exhales the watry Element upon the Wings of Heat's peculiar Levity, whereby it finds the readiest Passage for its *Exit*.

There are such almost infinite Canals, Vessels, and Pores, in the Frame and Composition of Animals, that they cannot be conceiv'd, much less are they to be discover'd to the naked Eye. Who can number the Hairs of his Head, every one of which has a distinct Nerve or Fibre? And many more there are lodg'd in their Interstices; nor is there any Doubt but the same Reason will hold throughout the Body. So Nature appears

appears at first Sight like a Prodigy; where-ever you look, you may see Canals, Strings, or Fibres; not the minutest Part of the Body, whether external or internal, is without them: Nay, the whole Structure is nothing else but a *Congeries* of Pipes tied together by proper Bands of Union.

Since I have enter'd into this Subject, of enquiring into that Fluid call'd Blood, and from thence occasionally to touch upon Perspiration, I shall beg Leave to continue on the Digression (I hope not unusefully). Since I have affirm'd the *Serum* to be the common nutritious Juice of the Body, I must proceed with the Separation of the *Serum* from the Blood, which is perform'd by Percolation through the Glands, which changeth its Redness, though not its Nature: For Dr. *Needham* affirms the Spermatick Parts are nourish'd by the *Serum*; and it is not improbable to suppose, that the Formation of the *Fœtus* is compleat before any Redness appear; and there are many Animals that have no Redness at all in the Blood, therefore call'd *Exanguious*, they being of a colder Temperament.

There are certainly two distinct Excretions in the Liver; the one is by the *Poribilarii*, the other by the Lymphæducts, which are here very numerous, and of whose Use I shall have Occasion (in a little Time) to give the World a larger Account. In the mean time, I shall observe to you, that these Lymphæducts in the Liver insculcate the Extremities of their Trunks with the *Poribilarii*, which cannot be said of any two distinct Sorts of Vessels that carry distinct Liquors in them throughout the whole Body again. From hence I might attempt some Account of the Secretion of that Liquor we call Urine, and of its nearer and more ready Passage to the Bladder. But let this Hint suffice, till I have Time and Opportunity to bring that Discovery to Light.

The Parts of the *Serum* are Products of the Nourishment eaten, and the Materials out of which all the Parts of the Body, as well nutritive as excrementitious, are made: As first, The *Saliva* is but Part of the *Serum* separated by the Salivatory Glands, as the Liquor of the Ventricle is deriv'd from the glandulous Coats thereof. This being but a rude Mixture of alimentary and excrementi-

tious Parts, wants a farther Separation, which is done by more *Serum* still thrown on the alimentary Mass in the Guts, both by the great Channel of the Pancreatick Duct, and the lesser Oozings of all the spongy Glandules of the Guts and Mesentery, which promotes the former Separation by the Addition of the Bile, which being mix'd with this Mass, attenuates all the Juices in the *Duodenum*: And after all this, the *Serum* is again cohobated (if I may so term it) upon the alimentary Mixture in *Receptaculo Chyli*, and so passeth with it, being squeez'd up the *Thorax*, till it become united to the Blood; though there is not any momentary Mutation made of it, either in the Heart, Lungs, or elsewhere, but by the Agitation of its Parts admitting the Spirits to pass and repass through it, till 'tis gradually work'd up into the Nature of Blood and *Serum*, which Fluid makes Perspiration of such absolute Necessity for maintaining the Animal Life in such a State as we observe it; nay, and that of Plants too, in which it appears to be as useful as it is in the Nutrition of Animals.

For it is wonderful to observe what assiduous Perspiration there is always in Vegetables; nay, what a profuse Distillation thro' all their Pores; indeed so great sometimes, that many Trees have run like Fountains, as the Pine, and the Fir, which contain in them much viscus Juice, and withal cast off great Quantities of Water; because that viscus Juice which is the proper Aliment of those Trees cannot permeate the closer Pores, unless diluted with a sufficient Quantity of Water, so that it may be reduced into finer Particles, which requires immense Quantities of Water to perform, and consequently a powerful Evacuation: But it is certain, that not an hundredth Part of the Water which is applied to the Roots or Seeds of Plants, and which they imbibe by the Protrusion and expansive Force of the Air, is converted into the Growth and Nutrition of the Plant; but it transpires, and is exhal'd in its Motion thro' the succiferous Vessels into which it is convey'd. And here by the by it will not be out of the Way to observe, how far the expansive Particles of the Air may contribute to the Nutrition and Augmentation of Plants, and the introducing their nutritious Juices: For those long and obtuse Par-

ticles of Matter, which penetrate and constitute all dense and compact Bodies, gain Admittance into Plants, by dilating their Vessels as the nutritious Juices pervade their Pores; though that nutritious Juice is not meer elementary Water, but a certain viscous Matter, which lies undiscover'd, and is convey'd in that Vehicle; for the viscous Juice it self is not so adapted to penetrate the closer Pores, till it be first attenuated and divided into subtiler and finer Parts, and so made more fluid, that, together with the Water, it may more readily and with the greater Facility be convey'd through the minutest *Tubula* of Vegetables.

It will then follow, if we rightly consider the Motions of the Fluid in Vegetables analogous to that of Animals, that Air is a very considerable Ingredient, and the efficient Cause of the Motion of the several Fluids of the Animal Body; for when a Rarefaction is made by the Attrition of the Solids, the subtiler Particles of that Body being long and obtuse, easily insinuate themselves into the closer and compacter Parts of the Body; after which will follow the globulous Particles of the Fluid, from the Distention that was made for them by the foregoing Particles of Air, which expand themselves as they are put into quicker Motion.

Since therefore we have occasionally run our selves into the Argument of insensible Perspiration, it will be necessary to consider how far those six Things we call *Non-naturals* do affect us. And Physicians, that wisely follow the Directions of Nature, ought to show themselves wonderfully solicitous about the Uses of Perspiration, when they consult the Cure of Diseases.

The first of those Things call'd *Non-natural* is Air, of whose Use and Efficacy, either in the Preservation of Health, or Cure of Diseases, I suppose few are ignorant; but that it chiefly affects us, when it either assists or hinders Perspiration by its Admission or Retromission; for tho' it enter by Respiration, this only appears to be a Species of Perspiration, ordain'd by Nature for throwing off the fuliginous Vapours of the Heart and vital Parts. Nay, it is by the Inspiration of this Air that the Motion is continued or detain'd; because, affecting the Parts through which it passeth, it either opens or constricts

the Pores, according to the Quality it was in when received: Therefore temperate Air is thought the most salubrious; for the hotter it is, it hinders the Perspiration by dissipating our Heat; but if colder, it obstructs the Exit or Passage of the Vapour by Constriction. The humid and watry Air gluts up and fills the Spiracles of the Skin, from whence *Hippocrates* says, *Ex Anni Tempestatibus in universum Siccitates assiduis Imbribus esse salubriores*. From hence the Use and Necessity of Garments was order'd by all civiliz'd Nations, to the End that preserving the Body from the too immediate Influence of the Extremities of the Air, a liberal Perspiration might be maintain'd. But since it was necessary that the Head and Face should be more expos'd to the external Air, Nature has fence'd the Brain on all Sides with hard Bones, as a constant Cloathing, that by its Sutures and numberless *Foramina*, which scarce any Injury of the Air can interrupt, there might be free Admittance for the cloudy Vapours of the Brain to pass away by: And when we lie down, we put off our Clothes, because the Body perspires better when cover'd in Bed, as those experiment who lie down bound in their Clothes; for the next Day they are us'd to complain of a Weight and Weariness of their Limbs: And to the same End we use external Fires, that they may contribute to the Continuation and Promoting of Perspiration, and the opening the Pores of the Body.

The second *Non-natural* is Meat and Drink, the whole Necessity of which depends on Perspiration; for if nothing was convey'd and dispers'd by the Pores, there would be no Need of Aliment, which certainly was instituted for that End and Purpose, that it might perpetually supply Matter for Perspiration; and therefore the Quantity of Aliment is to be measur'd by the Quantity of Perspiration, and that ought to be judg'd the exactest Measure of what we ought to eat, by what was wasted; from whence we should examine how great the Evaporation was, and in like Manner eat proportionably; so that the exhaling Parts, by the like Continuation, may draw Food from the Stomach, and be reciprocally supply'd to continue the Flame with alimentary Fuel. Again, the chiefest Reason of the Goodness of Food ought to be

be consider'd as it is assisting and conducing to Perspiration; for that we have establish'd to be wholesome which is easy of Digestion, and becomes soon dissolv'd. On the contrary, we affirm whatever contends with our natural Constitution, and is difficult of Digestion, to be hurtful and noxious: Else, what do Physicians mean, when they commend some Meats for being light and easy of Digestion, and condemn others that yield heavy and gross Nutriment? But because those that are light are readily digested, and reduced into subtiler Parts by Heat; but the others, since they are gross and heavy, contend with the natural Digestion, and cannot be remov'd without Exercise and great Labour; and therefore such-like Food becomes proper Aliment for Ploughmen and Mechanicks, the Heat of whose Stomachs is much greater by their daily Labour; for otherwise such Food affords a Juice too inspissate to be reduced into finer Parts, fit for Nutrition, and therefore leaves behind it much more Excrement. For Example: Bread, and such-like as are esteem'd fermentative, are reckon'd the best Food; because (by the Help of their Ferments) the other Eatables are reduced into subtiler and more spirituous Parts, and so being render'd fine and light, they are easily rais'd into Vapour, and perspire: And therefore we join Bread to be eat with other Victuals as a laudable Custom, and of the more Use, the newer it be after it is cold from the Bake-house; for it loses its Ferment by its Age; and therefore while new, is the properer to be eaten with the Flesh of Animals, as it is likewise with all Plants, which stop the Ferment of the Stomach, if not assisted by the Use of Bread. And this is well observ'd by other Nations who feed much upon Plants, that you shall rarely see a Foreigner eat any Kind of Fruit without Bread; so that the good Use of that which is amongst us is wholly owing to their Example, as likewise the Improvement in our Bread; the eating of which new, together with the drinking Ale and Beer in the same State, e'er the Ferment be lost, I take to be the chief Reason of the Healthfulness of the People of London, in respect to other great and populous Cities in the World. And if any will give himself Leisure to observe, he will find this Place seldomer inci-

dent to any Kind of Epidemical Sicknes, than any Village in the Country, in Comparison to the Number of its Inhabitants; for it is old Beer that stimulates the Fibres of the Guts and Stomach, hinders and allays the genuine Ferment of the Stomach, precipitates the Digestion, and frets off too much of the *Mucus* that adheres to the inward Coats of the Guts; and from thence causes Fluxes, Gripes, and Convulsions, often fatal to Children whose Nurses delight in such Liquors.

The third *Non-natural* is Sleep and Waking; for we relieve the Body by Sleep, not only because the Animal Faculty is at Rest, but because the Heat, drawing back and retiring to the internal Parts, better digests, attenuates, resolves and disperses the subtle Fluid through the Skin, *unde Viscerum Depuratio & Alacritas emergit*. In the Time of Waking, the Spirits transmitted to the Circumference of the Body powerfully dissipate the excrementitious Humours from the external Parts, from whence comes that necessary Vicissitude of Sleeping and Waking; to wit, that by one the internal, by the other the external, Parts might be exonerated from their depraved Juices; which Thing, if it should blindly happen, would bring no small Inconveniency to the Body.

The fourth *Non-natural* is Motion and Rest, the Advantage of which are chiefly as they contribute towards the furthering of Perspiration; for the Body dull'd with too much Rest, soon complains of a Weight and Laziness of its Members, by reason of the little Agitation of the Spirits; and consequently there happens a less Dissipation of the Humours, which then, for Want of being discharged, press upon the tendinous Fibres of the Muscles, which produces that Pain and Weight which we complain of by sitting or resting so long without Motion: But Exercise stirs up the Heat of the Parts, and by Force (as it were) procures a Resolution and Discussion of those excrementitious Humours which before loaded and griev'd the Parts; yet if Motion be too vehement and immoderate, it makes too great a Resolution of those good Juices design'd for the Nutrition of the Parts, which must languish upon a violent Expence, and wait till Rest repair them to their pristine State of Vigour.

The Things excluded and retain'd, constitute or make the Fifth Class of *Non-naturals*, not without less Regard to the Advantage of Perspiration: For the several Ferments have Respect to that Evaporation as their ultimate Design; and the Chyle is so elaborated and wrought up by those Alterations it has received, that it may become intimately united and homogeneous with the Blood; the only Scope and Intention of those Ferments being to render it a proper Vehicle for Nutrition of every distinct Part: So that the Separations of excrementitious and immiscible Parts, are made in all the several Fermentations and Digestions where the Perspiration is facilitated by subliming the grumous and balsamick Parts of the Blood into volatile Spirits, which are discharged by Evaporation. For if the impure Blood be brought to the Parts, it must follow that the Perspiration is contaminated in a great Measure; and therefore whatever is excluded by other Passages at such Time serving the Intention of purifying the Blood or Chyle also, conduce effectually to the Relief and Assistance of Perspiration. Therefore the Exclusion of the Excrements by Purging are thought so useful, because they give a greater Liberty and Freedom for a farther Discharge and Separation of the Fluid by the Secretory Ducts of the Glands, by rendering the Vessels less turgid and distended, and so of Consequence allowing the Humours a free Egress to exhale. But this Method of Perspiration is reduc'd to the Government of the Things excluded and retained, not that it can be contained in such strait Passages, for indeed, it is denied through all its Species; but because this it has in common with other Evacuations which depend upon the expelling of the Excrements.

Lastly, the Passions of the Mind bring up the Rear of this Troop of *Non-naturals*, and they are of no small Force in the Command and Government of the Body, whilst they are capable of promoting or retarding Perspiration, by the various Commotions they occasion in the Spirits: So Joy recreates and refreshes us, because the Spirits moving more briskly, excites a greater Heat through all the Members, by expanding of its Particles, which diffuse themselves immediately thro'

the whole Frame of the Body: But Sadness just produces the contrary.

In a Word, if we consider the Rules generally prescrib'd, as well to the Healthful as the Sick, about the Use of these Six Things describ'd, we shall find the chief Intention of 'em directed towards the promoting Perspiration. And *Sanctorius* seems to aim at little else in that Writing of his, confirm'd by undoubted Trials: But if the Reader be further curious on this Subject, I desire he would consult that late accurate Dissertation of *Dr. Coles*, *De Perspirationis insensibilis Materia & peragenda Ratione*.

That ingenious Author has assign'd the Matter of Perspiration to arise immediately from these three following Heads, a nutritious Juice, Blood, and the solid Parts; but excludes the Chyle from being understood thereby; as likewise the *Lympha*, for almost the very same Reason, he does arrest from that Imputation, altho' it be secern'd in the Habit of the Parts; because by proper Vessels it is carried directly (as he said of Chyle) either into the Blood, or deposited into certain Cavities within; from whence it can by no Means be admitted for the immediate Matter of Perspiration, unless by Chance something through the Relaxation of the Vessels out of the usual Course should issue forth: Therefore, that he may inquire into this triple Source, altho' the Weight of the whole he seems to lay upon the nutritious Juice, yet sometimes the Blood and the solid Parts must bear their Share.

In the first Place, he affirms of that which pertains to the Blood, (that he may from thence proceed) that there are certain Stoppages or Want of Passage from the respective Receptacles, (beside the Matter secreted in the Glands by a peculiar Art of Nature, which he assigns to be Sweat) by which they gain Admittance through the Skin; and as he allows, constitutes, and makes up a Part of the perspirable Matter; because when the Arteries and Veins which are distributed throughout the whole Surface of the Body, and not only in the internal Parts, but every where in the minutest Extremities of the Arteries, when they lay open their Passages; it cannot be denied but something in the Form of Vapour, from the Motion and Agitation of

of the Blood, as well from its Heat and Fermentation, by that Means distending those Apertures, may pervade the cutaneous Spiracles; and more from hence, that many of its Particles are much less than the Pores of those Vessels, (which must be granted). Hence, What should hinder the less from breaking out? But by this a very small Quantity is pass'd in a considerable Time; but more abundantly in the greater Perspirations celebrated by *Sanctorius*: For at those Times there is a greater Relaxation, and (as the Doctor says) flowing out from the Superficies of the nutritious Juice from all the cutaneous Vessels, and the hidden Fibres of the yet undiscover'd Secretions. Yet it is necessary a greater Share of these minute Vessels be allow'd to maintain and continue the Circulation, that the Blood may find an open and free Passage, and be propelled into 'em by a quicker Motion. In the mean Time the grosser, (which make up a greater Portion, and not less of Recrement, than that which truly constitutes the Blood) as it is obvious they are wont to be seern'd from those Secretories plac'd in the Middle of the Vessels; because, as all acknowledge, these Organs that are supplied with the excretory Ducts, are more properly adapted for the Duty of Secretion, as in Example of the rest, which are more deeply treasured in the Body, which convey such peculiar Liquors as are destin'd for their Cavities to receive, as *Bile, Saliva, Urine, &c.*

2dly, The solid Parts, (which truly form the Body, to which the Appellation of the Parts from the fluid Substances less properly appertain) as they owe their Originals; so in the same Place where they lose their Charge, at length they are releas'd from their Bands of Union: These, if they be altogether puff'd up from their Vesicles, as it appears highly probable from the continual Flux of Juice running in these Channels, must necessarily pass away incessantly from the Damage that otherwise would ensue from the Constitution of their Particles.

Indeed, these are continually nourish'd from the included Liquor creeping within; so in like Manner, they ought to cast out those settled Particles which grow stubborn by long Continuance: And by what easier Way, than by Perspiration, (and that by pro-

per Channels) can those Particles be scatter'd and dispers'd which are brought to the Skin, since this is the last Stage of the Body? If it be objected (says he), That there are many more of those Fibres which run in a direct Passage, and tend not to the Skin, but terminate in the inward Parts: He supposes these, either into the Veins, or other Cavities appointed for that Use, deposite their Superficies; but when those Substances so take upon them another Denomination, because now passing into a Store of Liquors with which they are intermix'd, by which Means it happens as if they were cast off by Transpiration; when from hence they serve for further Uses in the Body, or come to be exterminated by some other Artifice. This is what he contends for, That those little Fibres of the Solids which pertain to the Skin constitute and make up Part of the perspirable Matter, although, perhaps, as yet scarce sufficient, since the Resolution is very gentle and slow.

Granting this, as to some Part of this Matter it appears to him very probable, he continues, that,

In the third Place, the nutritious Juice running through the Fibres, supplies by far the greatest Part of this Matter for Perspiration. And the Doctor would have this nutritious Juice to arise from the Nerves. But let it be from what Cause soever, or by what Artifice it is perform'd, he positively assigns it as the chiefest Material of Perspiration, and endeavours to confirm it by several Arguments, which I can by no Means take Liberty to trace at this Time; and therefore shall only beg Leave to offer two or three short Experiments, which I will leave the World to judge of what Weight they be thought in Relation to this Hypothesis of the Doctor's.

Whatever has been affirm'd and said concerning the *Succus Nutritivus* of the Nerves, and the plausible Arguments that have been brought for the Animal Spirits and their Flux, by the nervous Fibres, I think will appear of little Validity to such as will consider the following Trials made to prove their Existence if they had had any.

I must confess, after all the diligent Search, and Inquiry I was capable of making, assisted by the Helps and several Inventions of others,

others, I was never yet able to find any Foot-steps whereon to build a Foundation for the Belief of Animal Spirits; and after I had exploded the Necessity or Use of 'em in accounting for the Circulation of the Blood, without which I doubt some would be at a Loss to resolve several difficult *Phænomena* which that System affords; but if the Mo-

tion of the Blood cannot be accounted for or understood without the Help and Assistance of Animal Spirits, I doubt there will be a Stagnation in Spite of all the Endeavours of Circulation, according to the Laws of Nature, and those Mathematical Causes by which we measure her in her regular or irregular Motions.

Of the several Effects of POISONS on Humane Bodies; with a Mechanical Account of Poisons, from Doctor Mead, Physician to St. Thomas's Hospital, Doctor Browne, Baglivi, &c.

WHat obtains the first Place among the material Causes of Diseases, are those Things which are the most active and powerful in a small Dose, and which most quickly destroy the Oeconomy of the Vital Motions, and can break and disturb the Actions of the Solids and Fluids; and these Things are commonly called Poisons: But they are either adventitious and extrinsecal, or else such as are begot in the Body; and these are Three-fold: First, Such as bring along with them a putrid Fermentation of the Fluid, and a contagious Infection. Secondly, A Caustick, which penetrates into the Solids. Thirdly, An Exotick, or Foreign Sulphureous Vapour, which stops the Circulation of the Humours, and extinguishes the volatile Spirituous Fluid of the Nerves. First, The penetrating fermentative Putrefaction occasions *Alaisms*, such as we are visited with in the Plague, malignant Fevers, and in all putrid acute Cases, as the Small-pox, Meazles, the Contagion of each which propagates a most agile preternatural Motion in other Bodies disposed to receive it. Besides this, there is a contagious fermentative Putrefaction of the Nature of a fix'd saline Caustick, such as we observe in Chronick Cases, as the Venereal Disease, Leprosy, Scabs, and scorbutick Ulcers; and the *Sphacelus* and *Cancer* are Exam-

ples of the Corruption of the more fix'd Parts of the Blood, which by touching contaminate the neighbouring Parts in the Body.

Poisons are of a caustick Quality, and these again of a twofold Nature, either very volatile and active, such as are in living Creatures, or more fix'd, which are found in Mineral Bodies. To the first Class, the Wounds and Bitings of Beasts and Insects, which are of a hot, revengeful, furious Disposition, are reducible; as Wolves, Mad Dogs, Vipers, Tarantula's, Scorpions and Crocodiles; the Substance of whose Venom or Poison is a Caustick of a fiery agile Nature, which penetrating intimately into the Nerves and membranous Fibres, acts vigorously upon them, and so raises Spasms, Convulsions, Fevers, and Inflammations.

Of the Mineral Kind, those which are of a fix'd caustick Nature are, Arsenick, Mercury Sublimatè, &c. which contract the Bottom of the Stomach and the *Duodenum* with horrible *Spasms*; afterwards they inflame the Parts, and draw the whole *Genus Nervosum* into Consent, as appears by the Spasms and Convulsions that follow. In the Vegetable Kingdom there are found a Sort of acrid Purgers which may be reckon'd among the Poisons, as White Hellebore, *Elaterium*, *Euphorbium*, &c.

The third Rank of Poisons are subtil sulphureous Vapours, which rarify the Blood, so that it distends the Vessels, particularly the minute ones of the Brain, with too great Violence, so that the Systole is made difficult, and the Motion of the Fibres by that Means lessened, because the spirituous Fluid in them stagnates, from whence the progressive Motion of all the Fluids is stop'd. Hence arises Palsies, Lethargies, Dreams full of Fear, Melancholy, &c. of which Kind the most celebrated are Nightshade, Henbane, and the several Species of Poppies.

Thus far we have spoken of external Poisons: We shall now come to those Things which are generated within the Body, and amongst them the most observable are the active, excrementitious, saline, sulphureous Humours, which are thrown off by the Pores of the Skin, which if they are repelled and forced back again into the Habit of the Body, prove powerful, dangerous Causticks; as is very evident to the Senses in the Small-pox, Meazles, Purples, St. Anthony's Fire, Gout, &c. And what grievous Symptoms attend such Revulsions, every Day's Experience witnesseth; for when the excrementitious Matter is freed from the Viscidity of the Blood which envelop'd it, it easily passes off by Transpiration; but being tied in by the Constriction of the Pores, and returning again upon the sensible nervous Membranes, and there pent up, it acts like a Poison, and produces the most grievous Disaffections. As for Example, if the Venom be brought to the *Meninges*, a Phrensy or Epilepsy; if it invade the Nerves of the Diaphragm and Lungs, a convulsive Asthma, a Palpitation and Trembling of the Heart, or a *Syncope*: In the Stomach or Gullet, it produces Humps, windy Inflammations, and troublesome Pains: In the Guts, Gripes, and such Costiveness or Binding as is difficult to be relieved. The like Things may be observed from suppressing foetid or stinking Sweat, from the Armpits, Soles of the Feet, and sudden stopping of profuse Critical Sweats in Fevers. The healing of inveterate Ulcers suddenly brings on a *Phthisis*, with spasmodick acute Pains; so the repelling of Pustules or Blotches in the Face or Head frequently affects the Eyes, Ears and Jaws. An unwary Check in a due and regular Tran-

spiration, is the chief Occasion of most epidemical Diseases; for of this Nature are almost all Kinds of Fevers, Small-pox, *Diarrhoeas*, Dysenteries, &c. which, if they are leisurely produced, they are not undeservedly ascribed to proceed from the Air, and the various Seasons that hinder Transpiration; for by this Means the salt, acrid, subtle Serum, is mix'd with the Juices of the Body, and vitiates and disturbs them: But the chief of all these Things from an interrupted Transpiration is, that the Bile, *Lympha*, and Mucous of the Guts, mixing with the Matter of the Sweat, increases the Malady; from whence is preternaturally form'd an acrid Caustick. Therefore the Ancients did not without good Reason assign the Cause of most, and those the greatest, Diseases, to the Bile, and plant 'em in the first Passages of the Stomach and Guts. All Fevers, and those Diseases which are derived from a corrosive Acrid, have their Residence in the first Region of the *Abdomen*; as all Intermitting, Burning, Bilious Fevers, Dysenteries, &c. which arise from the Bile, being more or less corrupted with the Acrimony and Viscidity adhering to the Coats of the Guts: For this Reason, those Things afford the most Relief which scour the first Passages from that Filth which loads the Blood, and so disturbs the Functions of the Vital Parts.

There is another Poison which is bred in the Body it self. This is a Putrefaction of the solid or fluid Parts; for nothing is more offensive to Life, nothing more obnoxious to the Mixture of the Fluids and the Solids, than Putrefaction it self, which may be justly esteem'd their Death. If these Things lie in the Passages of the Blood, they are soon discovered by a Languidness of the Spirits, a Decay of Strength, Convulsions, Faintings, a feeble Pulse, and Want of Sleep; as we discover in Plagues, Putrid and Autumnal Fevers. After the Lungs of consumptive Persons are grown putrid, they corrupt the whole Body, and waft it away by Degrees, tho' slowly, and with gentle Heat; but the Progress of Putrefaction is far greater in the fluid, than in the solid Parts; therefore there is more Danger, and Application ought to be made with greater Expedition.

Lastly, we shall speak of that which is most destructive of Life, which is a *Polypus*, or Coagulation of Blood or Humours; for we have said before, that the Cause of Life is seated in a continued Motion of the Fluids. Now there is nothing so quickly and effectually stops the Course of the Blood, and is so contrary and opposite to Life, as the Blood and Humours being constricted, and coagulating in the Vessels. There are many that frequently die suddenly of a *Polypus*, or Concretion of Blood in the Veins, or in the Auricles of the Heart; and there are many long and obstinate Diseases proceeding from a *Polypus*. Hence we meet with Palpitations of the Heart incurable, stubborn and contumacious *Asthmas*, Spitting of Blood, irregular and immoderate Profusions of the *Menses*: And we are daily Witnesses of the vast Inconveniencies that follow drinking of cold Liquors when the Body is hot; for the Cold coagulates the *Serum* of the Blood, and presently interrupts the vital Circuit.

I shall from hence proceed to give an Account, 1. Of the Viper, and other poisonous Animals; 2. The *Tarantula* and Mad Dog; 3. Of poisonous Minerals; 4. Of poisonous Plants and Vegetables; 5. Of venomous Exhalations, &c.

The Viper has always been so notorious for its Venom, that the most remote Antiquity made it an Emblem of what is hurtful and destructive; nay, so terrible was the Nature of these Creatures, that they were commonly thought to be sent as Executioners of Divine Vengeance upon Mankind for enormous Crimes which had escaped the Course of common Justice.

The Symptoms which follow upon the Bite of a Viper, when it fastens either one or both its greater Teeth in any Part of the Body, are, an acute Pain in the Place wounded, with a Swelling, at first red, but afterwards livid, which by Degrees spreads farther to the neighbouring Parts, with great Faintness, and a quick, tho' low, and sometimes interrupted Pulse, great Sickness at the Stomach, with bilious convulsive Vomitings, cold Sweats, and sometimes Pains about the Navel, and (if the Cure be not speedy) Death it self, unless the Strength of Nature prove sufficient to overcome these Disorders; and though it does, the Swelling

still continues inflamed for some Time; nay, in some Cases more considerably upon the abating of the other Symptoms, than at the Beginning; and often from the small Wound runs a sanious Liquor, and little Pustules are rais'd about it; the Colour of the whole Skin is changed yellow, as if the Patient had the Jaundice.

These Mischiefs, although different Climates, Season of the Year more or less hot, the greater or less Rage of the Viper, the Beast it self of a larger or smaller Size, and consequently able to communicate more or less Venom, and the like Circumstances, may variously heighten or abate them, yet do usually discover themselves much after the same Manner in all, unless the Bite happen not to be accompanied with the Effusion of that Liquor which is the main Instrument and Cause of this violent and shocking Disturbance.

But before I proceed to enquire into the Nature and Manner of acting of this Juice, it may be worth while to take Notice that this is not made on purpose to be deadly and destructive to Mankind; but that the true Design of it is (though Authors have not regarded it) to perform an Office and Service of so great Moment, to the Preservation of the Individual, that without it this Creature could not subsist.

For Vipers live chiefly upon Lizards, Frogs, Toads, Mice, Moles, and the like Animals, which they do not chew, but swallow down whole, and they lie in the Stomach; or if that be not big enough to receive them, partly in that, and partly in the *Oesophagus*, which is membranous, and capable of great Distention, till, by the salival Juices of those Parts, together with the Help of the Fibres of the Stomach, and the Contraction of the Muscles of the *Abdomen*, they are gradually dissolved into a fluid Substance, fit for the Nourishment of their Bodies, which is the Work of many Days. This is one Reason why these Creatures can live so long without taking any fresh Food, which I have known them to do three or four Months; as another is, that their Blood is a grosser and more viscid Fluid than that of most other Animals; so that there is but a very little Expence of it by Transpiration, and consequently less Need of Recruit. This

not only *Microscopes* discover, but Reason teaches; because there is but very little muscular Force in the Stomach to comminute the Food, and make a Chyle of fine Parts; and therefore the Blood must accordingly be of a tough and clammy Consistence. Besides, the Heart of a Viper has properly but one Ventricle, and the Circulation of the Blood is performed after the same Manner as it is in a Frog and Tortoise, in which not above one Third of it passes thro' the Lungs; upon which Account its Comminution in them by the Air is proportionably lesser than in other Animals. Now such a Manner of Feeding as *this*, does necessarily require that the Prey should upon the first Catching be immediately kill'd, otherwise it were by no Means fit to be let into the Stomach; for we are not to think, that the Force of this Part would be alone sufficient to destroy it, the Subtily of a living Creature (besides the Consideration of the Weakness of the Fibres) being in a great Measure able to elude *that*, as indeed we do every Day find live Animals in the Ventricles of others; and therefore to do *this* is the proper Use both of their Teeth and their Poison; for which being designed and adapted, it is no Wonder if the Viper, this same Way by which it destroys its Prey, proves sometimes mischievous to any other Creatures besides, when it happens to be enraged, or by any Provocation stirred up to bite.

The Description of the poisonous *Fangs*, their Make, Articulation and Motion, as also of the Glands that separate the yellowish Liquor, and the Bags that contain it, I shall give, together with some Anatomical Observations, at the End of this Discourse.

This venomous Juice it self is of so inconsiderable a Quantity, that it is no more than one good *Drop* that does the Execution; and for this Reason Authors have contented themselves with Trials of the Bite upon several Animals, never essaying to examine the Texture and Make of the Liquor it self; for which Purpose I have oftentimes, by holding a Viper advantagiously, and enraging it till it struck out its Teeth, made it to bite upon somewhat solid, so as to void its Poison; which carefully putting upon a

Glass Plate, I have, with a Microscope, (as nicely as I could) view'd its Parts and Composition.

Upon the first Sight, I could discover nothing but a Parcel of small Salts nimbly floating in the Liquor; but in a very short Time the Appearance was changed, and these saline Particles were now shot out as it were into *Crystals* of an incredible Tenuity and Sharpness, with something like Knots here and there, from which they seem'd to proceed; so that the whole Texture did in a Manner represent a *Spider's Web*, though infinitely finer and more minute; and yet withal so rigid were these pellucid *Spicula* or *Darts*, that they remained unalter'd upon my Glass for several Months.

I have made several Trials with this *Juice*, in order to find out under what Tribe of Salts these Crystals are to be ranged; and not without some Difficulty, by reason of the minute Quantity of the Liquor, and the Hazard of Experiments of this Nature, have plainly seen that it does, as an *Acid*, turn the blue Tincture of *Heliotropium* to a red Colour.

I did not succeed so well in mixing it with Syrup of Violets, and yet it did really seem to induce in this a *reddish Hue*; but I am very certain it did not at all change it to a *greenish* Colour, as it would have done if any ways *alkalious*.

This may suffice, in their own Way of arguing, to convince those Gentlemen, who (without the Assistance of any Experiments) meerly to serve an *Hypothesis* which they have too fondly taken up, have with great Assurance told the World, that the Viperine Venom is an *Alkali*, and consequently to be cured by *acid* Remedies. But it is far more easy to spin out a false Notion into precarious Reasonings, than to make faithful Experiments, and fairly improve them by just and necessary Consequences.

To proceed, this Discovery agrees very well with a Relation communicated by an Ingenious Person to Dr. *Tyson*, which does so much illustrate this Matter, that I shall transcribe it in his own Words, out of the before-cited *Philosophical Transactions*. He says then, That being in the *Indies*, there came to him an *Indian* with several Sorts of

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Serpents,

Serpents, offering to shew him some Experiments about the Force of their Poison: Having therefore first pull'd out a large one, the *Indian* told him this would do no Harm; and making a Ligature on his Arm, as in letting Blood, he expos'd it naked to the Serpent, being first irritated to make him bite it; the Blood that came out of the Wound made by his Teeth, he gathered with his Finger, and laid it on his Thigh, till he had got near a Spoonful: After this he takes out another called *Cobra de Capelo*, which was lesser, and enlarges much upon the Greatness of his Poison; to shew an Instance of it, grasping it out about the Neck, he expresses some of the Liquor in the Bags of the Gums, about the Quantity of half a Grain, and this he puts to the coagulated Blood on his Thigh, which immediately put it into a great *Fermentation*, and working like *Barm*, changed it into a *Yellowish* Liquor.

This I say does well enough accord with what we have been advancing concerning the Nature of this *Juice*; for Mr. *Boyle* has long since proved by Experiments, that there is nothing of Acid in human Blood; and Doctor *Piscarn* has demonstrated, that the *Acid Substances* of Vegetables taken into the Stomach, are, by the Action of this Part, the Lungs and Heart, when they come into the Blood Vessels, turn'd to *Alcalions*; so that the Arterial Fluid must necessarily be considered as an *Alkali*; and therefore, according to the known Principles of Chymistry, its Mixture with such a Liquor as we have discovered the Viperine *Sanies* to be, will always exhibit some such Appearance as this now related.

But not to engage any farther in these Sort of Controversies, we may perhaps from the foregoing Observations receive some Light in order to understand the Nature and Reason of all those Symptoms which attend the Bite of this Creature. For the pungent Salts of this Venom, when with Force thrown into the Wound, will not only, as so many *Stimuli*, irritate and set the sensible Membranes, whereupon there necessarily follows a greater Afflux than ordinary of the Animal Juices that Way (as is manifest from the *Bellinean* Doctrine, *De Stimulis*) so that the

wounded Part must be swelled, inflamed, livid, &c. but also these *Spicula* being mix'd with the Blood, will so disjoin and disunite the Parts of it, that its Mixture must be quite alter'd; and from the various *Cohesion* of its *Globules* will arise such different Degrees of *Fluidity* and *Impulse* towards the Parts, &c. from what this Liquor had before, that its very Nature will be changed, or, in the common Way of Speaking, it will be truly and really *Fermented*.

To understand aright how all this is done, it is necessary to hint somewhat concerning the Nature of *Fluids* in General, and those Alterations in them which we call *Fermentations*; for I shall retain this known Word, though in the proper Sense in which 'tis commonly used, there can be no *Fermenting* of the Liquors in the Animal Body.

And here I must refer to the Treatise of *Bellini de Fermentis*, who has with great Clearness shewn, that there is in all Fluids, not only a simple *Contact* of their Parts, but also a *Nisus in Contactum*, or *Cohesion*, and this of a certain *Degree* or *Force*, and besides, of a particular *Direction*; which is indeed, tho' express'd in other Words, the same with the Attraction of the Particles one to another. This Mr. *Newton* has demonstrated to be the great Principle of Action in the Universe, has taught us the Laws of it in the greater Quantities and Collections of *Matter*; and he who rightly studies his Philosophy will understand, that the same obtains in the most minute and finest *Corpuscles*, which do unite into Bodies of different *Solidity* and *Make*, according to the Degree with which they do mutually *attract* each other, and to the *Superficies* by which, when drawn, they do *touch* and *adhere*. To this if we add a *Pression* of the several Parts of the Fluid every Way, and consider withal, that this *Uniform* Attraction of the Parts to one another must be variously changed by the different Attraction of heterogeneous Bodies mix'd with them, we have the great Principles of all Fluids, upon which their several *Phænomena* do depend.

And hence it follows, that whatsoever *Power* is sufficient to make a Change in this Attraction or Cohesion of the Parts, makes

an Alteration of the Nature of the Fluid ; that is, as the Chymists express it, puts it into a *Fermentation*. And if any one shall think it necessary to enquire into the particular Manner of producing such an Effect, we may perhaps, in so abstruse a Matter, not improbably conjecture thus ; That our Blood consisting chiefly of Two Parts, a simple *Lymph*, and an infinite Number of small *Globules*, containing a very subtle and elastick Fluid ; these acute Salts, when mingled with it, do prick those Globules or *Vesiculae*, and so let out their imprisoned active Substance, which expanding it self every Way, must necessarily be the Instrument of this speedy Alteration and Change. From such an *Hypothesis* as this, (and, it may be, not very easily from any other) we may account for many of the surprizing Phenomena in the Fermentations of Liquors ; and as precarious as it seems, its Simplicity and Plainness, and Agreement with the fore-mentioned Doctrine, will, I believe, recommend it before any other, to those who are not unacquainted with *Geometrical* Reasonings. But I wave these Considerations at present, and shall only add one Remark or two with Relation to the Purpose in Hand, and so proceed.

In the first Place then, we may from this *Theory* learn, how it comes to pass that so small a Portion of Juice should infect so great a Quantity of Liquor ; for in order to do this, it is not necessary that the Venom should be at the very first mix'd with all its Parts, but it is sufficient that it prick some of the *Bladders*, and the elastick Matter of these being let out, will be a nimble *Vehicle* to the acute Salts, and not only by its Activity disperse them through the Fluid, but restore to them their decreasing *Force*, and thus continue their Effects, till a great Part of the Liquor undergoes, at least in some Degree, the like Alteration.

And this will the more easily happen in the present Case, because the *Force* with which this Poison is thrown into the Blood, as appears from the Mechanism of the discharging Organs, is very great, and consequently its Effects will be proportionably violent, or the Mischief more large and diffused.

The Want of this may be one Reason

why the Experiment of first making a Wound in the Flesh with any sharp Instrument, and then dropping in the *Sanies*, may not always succeed so well in killing Animals, as one would from the preceding Doctrine be ready to expect. Tho' if some Amends be made for this Defect, by taking a greater Quantity of the Juice, and carefully insinuating it, it proves equally Fatal this Way, as when immediately discharged from the Viper it self. Thus it might happen that those Trials of this Kind, which were happily made by Sr. *Redi*, might not however convince Mr. *Charas*, in as much as there is oftentimes a great deal of Difference in the Event of Experiments, when made with Purpose, and a Design that they should succeed, and when timorously and cautiously managed, lest they should unluckily overthrow a darling *Hypothesis*.

The other Observation I shall draw from the foregoing Theory, is this, That it appears from hence what a vast *Variety* there may be in the Fermentations even of one and the same Fluid ; for these being no other than *Changes* made in the *Cohesion* of the compounding Particles, are capable of as many Alterations as *Motion* in its *Degrees* and *Directions* can admit of, which are really infinite.

This I mention with Regard to some of the following *Essays*, in which, if we ascribe many Symptoms, seemingly very different, to a Ferment rais'd in the Blood, it may be considered, that the Nature of this Cause is such, as according to the several Properties of the *Primum Agens*, or *Fermenting Power*, to bear by far more Varieties than any one can be aware of.

To return to the Viper ; the Effects of such an Agitation of the Blood, as we have been describing, must not only be whatever are the Consequences of a disturbed *Circulation*, and irregular and interrupted *Secretion* of the Spirits, as low Pulse, Faintings, Sickness, Palpitation of the Heart, convulsive Vomittings, Tremblings of the *Body*, &c. but also the *Texture* of this Fluid being thus broken, those Parts of it which are of the slowest Motion, and greatest Viscidity, will be easily separated from the others ; such they are which, when united together, do compound

the Bile; and therefore these will tinge the capillary Vessels, and fine *Ducts* in the Skin, with a yellowish Colour; that is, will induce an *Icterus*, or Jaundice.

For it is not only (if at all *Primarily*) from an Obstruction of the *Biliary Canals* that this Symptom does proceed, but also from any Cause whatsoever, which either destroys the saline Part of the Bile, by the Means of which its Oil is kept mix'd with the Water of the Blood, or else increases the oily and sulphureous Part to that Degree, that tho' it be duly impregnated with Salt, yet the watery Part of the Blood, which can only take up a certain Proportion of it, being already *Saturated*, can receive no more; or lastly, does, by *disuniting* the compounding Particles of the Blood, alter that *Intestine Motion* and Agitation which is necessary to carry along thro' the Vessels, together with the more volatile Parts, those which are more clammy and glutinous. For in all these Cases 'tis plain that the bilious Corpuscles must be *precipitated* upon those Parts of the Body where there is least Motion, that is, upon the extreain Superficies.

And tho' this Theory may perhaps appear extravagant, because new and uncommon, yet it will not, I believe, seem ill grounded or irrational to those who understand the Doctrine of the *Mixture* of heterogeneous Fluids and their *Separation*; and who with all know, that the Vessels are rarely obstructed, unless it be from the Fault of the Liquid they carry, and consequently that a Defect in the Bile it self must be (excepting some extraordinary Cases) antecedent to the Obstruction of the *Biliary Ducts*.

In short, the different Cure of this Disease confirms these Notions; for an *Icterus* from the first Cause assigned, which is generally owing to a sedentary Life, Want of Exercise, &c. and attended with an extreme Costiveness and white *Faces*, is cured by volatile, acrimonious, and bitter Salts. From the Second produced oftentimes by drinking strong Liquors, Spirits, &c. and accompanied with a *Diarrhœa*, partly by diluting and tempering, partly by Stomachic and strengthening Medicines. As the last Species of it (for the Sake of which we have

mentioned the other) is removed by such *Antidotes* as overcome and destroy the venemous Ferment, corrupting the Blood, and breaking its *Compages*. But to have hinted these Things may abundantly suffice for the present.

We must however take Notice, That tho' the main Alterations made by this Poison be in the Fluid of the Arteries, yet that *That* of the Nerves may hereby be considerably changed too; for *This* consisting, as well as the Blood, of differing Parts, and being dispersed in small *Tubes* all over the Body, is not only very capable of various Degrees of Force, Impulse, &c. but undulating continually towards the Brain, and being the chief Instrument of Motion and Action, may perhaps sometimes more immediately convey the Mischief to the sensible Membranes, and thus be the Cause of those violent Pains, Convulsions, Sickness, &c. with which those who are bitten are presently seized.

Many are the Experiments I could relate to evince the Truth of this Reasoning concerning the viperine Venom, which do entirely agree with those made by *Sr. Redi*, whose Judgment and Sincerity in Observations of this Nature no Body ever called in Question, till Monsieur *Charas* having espoused a Notion, that this Poison does not lie in the Yellow Liquor of the Gums, but in the enraged Spirits of the Viper, raised new Difficulties about the Success of some Trials made in *France*, endeavouring thereby to invalidate the Force and Authority of those made in *Italy*.

I shall therefore, in order to put this Matter out of all Doubt, mention two or three Experiments made by Doctor *Areskine*, when at *Paris*, that it may appear how defective those of Mr. *Charas* are, and that the Difference of the Climate does not (as some began to imagine) make any considerable Alteration in the Effects of this Venom, or its Manner of Killing.

First then, having got a large Female Viper, he made it to bite Six Pigeons, one after another; the First and Second that were bit, died within about half an Hour, one a little Time before the other; the Third lived about two Hours; the Fourth seem'd to be very sick, but recovered; the Fifth and Sixth were

were no more hurt than if they had been prick'd with a Pin or Needle.

Then he cut off the Head of a brisk Viper, and let it lie twenty four Hours, with the Fangs of which he wounded one Pigeon in the Breast, and another in the Thigh, which both expired as soon after as if they had been bit by a living Viper. After this, having got a great many Vipers together, he made them bite upon a Piece of Glass of a cylindrical Figure, by this Means preserving the Yellow Juice which they emitted, and slightly wounding two Pigeons, he first let the Bleeding be stopped, then put some of this Liquor into the Wounds, upon which both the Pigeons died about two Hours after.

The same ingenious Person tells me, that Monsieur du Verney made not only these, but also several other Experiments of the same Nature, in the Royal Academy, with the like Success.

These Proofs are so convincing and full, that no one, I think, can desire more; but they will receive yet a farther Confirmation from the Apparatus or Mechanism of the Organs, with admirable Nicety contrived for the Discharge of this Venom, of which more by and by.

Nor is it any Objection against all This, that the *Liquor* is innocent and harmless in the Mouth or Stomach of any one, so as that it may be safely tasted or sucked out of the Wound, and swallowed; for, as we observed before, that many *Acid* Substances taken into the Stomach are by the Action of that Part turned to *Alkalious*, so there is no Question but these Saline *Spicula* are, partly by the Muscular Force of the Fibres, partly by the Salival Juice, all broken and dissolved; or if any can pass into the Intestines, the Balsam of the *Bile* will be an *Antidote* for them; the Reason of which will appear when we come to the Cure.

In the mean Time it may not be amiss to remark, That even the Ancients seem to have known thus much concerning the Nature of this Poison: Of this, *Galen* gives us Testimony in several Places; particularly in his Book de *Temperamentis*, where he takes Notice, that nothing has the same Power upon the humane Body outwardly as inwardly: Thus (says he) neither the Venom of the Viper, nor of the Asp, nor frothy Spiittle of the Mad Dog, are alike mischievous when they fall upon the Skin, or enter into the Stomach, as when outwardly communicated by a Wound.

Of Poisonous Creatures.

AS the Viper is hurtful by instilling a liquid Poison into the Wound made by its Teeth; so likewise are all venomous Creatures whatsoever, whether they bite or sting, tho' there be some Difference in the Contrivance of their Organs, mischievous after much the same Manner, and mostly for the same good Use and Purpose, that is, in order to kill their Prey.

This will fully appear in examining the Instruments of Death in several of them: First then, the Spider, which lives upon Flies, Wasps, and such like *Insects*, is provided with a hooked *Forceps*, placed just by the Mouth, very sharp and fine; with this he pierces the Flesh of little Creatures caught in his Web, and at the same Time infuses a Juice into the Puncture, by which Means

the Animal being killed, he sucks out the Moisture from the Body, and leaves it a dry husky Carcase.

Mr. *Van Leewenhoek*, in his Account of *Spiders* lately published, has, together with the other Parts, by the Help of his Glasses, describ'd these Weapons, which he finds to lie couched on each Side the Mouth, in a Row of Teeth, till they are raised to do Execution. These Rows of small Teeth are designed to hold the Prey, that it may not escape the Force of the Bite. And in the convex Part, towards the Point of each Claw, he has delineated a little Aperture or Slit, thro' which he supposes the Poison issues out at the same Time the Wound is made.

This Situation and Motion of these Parts I have several Times view'd, but was never able

able to discern the *Exit* or Opening; which, having a just Deference to the Industry and Application of so nice an Observer in Things of this Nature, I at first imputed to my own Unskilfulness in such Enquiries, knowing my *Microscope* to be very good; till at last, after repeated Trials, I very plainly saw, That nothing dropped out of the *Claws*, which were always dry while the Spider bit, but that a short white *Proboscis* was at the same Time thrust out of the Mouth, which insinuated a *Liquor* into the Wound.

Then I concluded, That Mr. *Leeuwenhoek* had delineated the *Apertures* in these *Weapons* only from the *Analogy* which he thought they must bear to the Viperine *Fangs*, the *Sting* of the *Scorpion*, &c. And I was confirmed in this Opinion by examining a *Claw* of the great *American Spider*, describ'd (tho' but lamely) by *Piso*, and called *Nhamdu*: This was given me by Mr. *Pettiver*, and being above fifty Times bigger than that of the largest *European Spider*, if there had been any Slit in it, my Glass would no Doubt have discover'd it; but yet I found it to be quite solid.

And indeed the Quantity of *Liquor* emitted by our common Spiders, when they kill their Prey, is visibly so great, and the wounding *Weapons* so minute, that they could contain but a very inconsiderable Portion thereof, if it were to be discharged that Way.

To this Purpose, I remember Mr. *Boyle* somewhere tells a Story of a Person blinded by a Spider dropping its *Venom* into his Eye, which, tho' it can hardly find Credit with some, is however confirmed by what *Piso* relates of his *Nhamdu*, viz. That in catching it great Heed is to be taken, lest its *Poison* fall into the Eye; this causing a total Loss of the Sight.

What Mr. *Leeuwenhoek* observes the Enmity these Creatures bear to one another, I have often seen; for if Four, Five, or more, be put together into a Glass, they immediately fall to *Fighting* with all the Fury imaginable: *Limbs* struck off are usually the *Preludes* to the terrible Slaughter, which continues till all are killed, the surviving Conqueror himself most commonly dying of his Wounds.

The *Weapons* of Mischief in the *Scolopendra* are much the same with those of the Spider, only larger. One of these Creatures I had brought to me alive out of a Ship which came from the *East-Indies*, where *Bontius* says their Bite is so painful that it makes People almost mad, but it died before I had an Opportunity of making Trial of its *Poison*; however, I very diligently looked upon the *Claws*, and found them to have no more Cavity than is necessary for the Insertion of their Muscles, nor any *Exit* or Out-let towards their *Apex*; these therefore serve only to pierce the *Flesh*, and the *Venom* is infused from a *Proboscis* out of the Mouth; tho' this I could not very well discern, because the Parts had been kept too long dry before I examined them.

The Case is much the same with *Stinging* Animals; of these the *Scorpion* is the chief, whose *Virus* in different Countries is more or less dangerous, according as 'tis exalted by various Degrees of *Heat*: Thus in *Africa* particularly its Effects are so dreadful, that, as *Joann. Leo* tells us, the Town of *Pescara* there is in a Manner left desolate by the Inhabitants in the Summer-time, by reason of the great Abundance of these Creatures, certain Death following their *Sting*.

Some of this deadly Kind (the same, tho' not so large with that in the *East-Indies*, of which *Swammerdam* has given a very accurate Description and Figure) Sr. *Redi* had sent him from *Tunis*; and it being *November*, irritated them to *sting* Pigeons, Pulletts, &c. without any bad Effect at all of their *Poison*; but upon the approaching Spring, one of them which had been kept all the Winter, nay eight Months, without any Food, and the Wound of whose *Sting* before was harmless, stung to Death two Pigeons successively; but a third and Fourth wounded in like Manner suffered no Hurt: Yet having let the *Scorpion* rest all Night, he killed another Pigeon the next Morning.

At the Point of the *Sting* he very often could discern a small Drop of white *Liquor*, which when the Wound was made entered into the *Flesh*.

As this *Liquid Venom* is either not separated from the Blood into the Cavity of the *Sting* during the Cold of Winter, or at least the

Scorpion wants Strength at that Time to throw it out with Force and Energy; so even in the hot Months, after it is exhausted by two or three Attacks, the Sting is no longer hurtful, till the Expence of this Juice is recruited by Time.

'Tis very remarkable concerning this Insect, what an ingenious Gentleman, who lived several Years in *Barbary*, told me he had many Times tried; that if it be surrounded with a Circle of *Burning Coals*, it does, upon the Sense of the Heat, turn it self violently every Way to make an Escape; but finding it impossible, and the Pain from the Fire increasing, it strikes it self twice or thrice with the Sting on the Back, and immediately dies of the Wounds.

Others may make what Reflections they please on this *Self-Murder*, it is to me beyond all Dispute sufficient to decide the Controversy between Writers, whether poisonous Animals of the same Species can kill each other. Which is not only confirmed by what we before observed of the Spider, but is likewise true of *Vipers*; for Doctor *Herman* bringing from the *Indies* Three of the *Cobras de Capelo* all in one Glass, Two of them were killed in the Voyage by Fighting.

As the *Viperine Venom* is the Quintessence and most active Part of those Animal Juices with which the Viper is nourished, so is also that of the Scorpion; for this Insect lives chiefly upon *Locusts*, &c. and the same Person from *Barbary* inform'd me, that seeing oftentimes *Locusts* sticking up in the Ground as if they were set there, by looking he found that some Part of them was always eat away, and that these Places were the Holes of *Scorpions*, who had dragg'd their Prey thither, and fed on it as they had Occasion.

In like Manner as the *Axungia Viperina* cures the Bite of the Viper, so also the *Oleum Scorpionum*, or Oil in which *Scorpions* have been infused, is a present Remedy for the Sting of this Creature.

The Mechanism of the Sting of a Bee, Doctor *Hooke* has very accurately described. One may with the naked Eye sometimes see it discharge the *Venom*; and in this, by the Help of a Glass, I can easily discover a great Number of minute *Salts* floating.

And indeed, this Apparatus or Contrivance is so universal, that we find even in *Vegetables* something analogous hereunto; for the last mentioned Author has shewn us, that the pricking Points of *Nettles* do at the same Time they pierce the Skin infill a Venemous Juice into the Wound.

Of the Bite of the Tarantula, and Mad Dog,

Join these Two Poisons together, because tho' they differ very much in their Effects, yet both do agree in this, that they induce a particular *Delirium sui Generis*, attended partly with *Maniacal*, partly with *Melancholy* Symptoms.

The *Tarantula* (of which the Figure may be seen in *Baglivy's Dissertation*) is a Spider of *Apulia* of the *Oftonocular* Kind; that is, of that Species that has eight Eyes, and spins Webs; it has eight Legs, four on each Side, and in each Leg three Joints; from the Mouth proceed two Darts, in Shape just like to a hooked Forceps, or Crab's Claws; these are solid, and very sharp, so that they can easily pierce the Skin; and between these and the

Fore-Legs there are two little Horns, which I suppose do answer to those Bodies called from their Use in *Flies* the *Feelers*; because as they do, so this Creature is observed to move 'em very briskly when it approaches its Prey.

This, as other Spiders do, propagates its Species by laying Eggs, which are very numerous; so that there are found sometimes in the Female, when dissected, a Hundred or more, and these are hatched partly by the Heat of the Mother, partly by that of the Sun, in about 20 or 30 Days Time.

There is also a Spider of the like Nature with the *Tarantula* in the *West-Indies*, which

Fr.

Fr. Hernandez describes by the Name of *Hoitzocail*, or the *Pricking Spider*; and says, that its Bite induces Madness.

In the Summer Months, especially when the Heats are greatest, as in the Dog-Days, the *Tarantula*, creeping among the Corn in the Fields, bites the Mowers and Passengers; in the Winter it lurks in Holes, and is scarcely seen; and if it does bite then, it is not venomous, neither does it induce any ill Symptoms.

But in the hot Weather, altho' the Pain of its Bite is at first no greater than what is caused by the Sting of a Bee, yet the Part quickly after is discoloured with a livid, black, or yellowish Circle, and raised to an inflam'd Swelling; the Patient within a few Hours is seized with a violent Sickness, Difficulty of Breathing, universal Faintness, and sometimes Trembling, with a Weakness of the Head; being asked what the Ail is, makes no Reply, or, with a querulous Voice, and melancholy Look, points to his Breast, as if the Heart was most affected.

During this mournful Scene, all the usual *Alexipharmick* and *Cordial Medicines* are of no Service; for notwithstanding their repeated Use, the Patient growing by Degrees more melancholy, stupid, and strangely timorous, in a short Time expires, unless *Musick* be called to his Assistance, which alone, without the Help of Medicine, performs the Cure.

For at the first Sound of the *Musical Instrument*, altho' the Sick lie as it were in an Apoplectick Fit, they begin by Degrees to move their Hands and Feet, till at last they get up, and fall to Dancing with wonderful Vigour, at first for three or four Hours, then they are put to Bed, refreshed from their Sweating for a short Time, and repeat the Exercise with the same Vehemence, perceiving no Weariness or Weakness from it, but professing they grow stronger and nimbler the more they dance.

At this Sport they usually spend Twelve Hours a Day, and it continues three or four Days; by which Time they are generally freed from all their Symptoms, which do nevertheless attack 'em again about the same Time the next Year: and if they do not take Care to prevent this Relapse by Musick, they

fall into a *Famdice*, Want of Appetite, universal Weakness, and such like Diseases; which are every Year increased, if Dancing be neglected, till at last they prove incurable.

As Musick is the common Cure, so they who are bitten are pleased some with one Sort of it, some with another; one is raised with a Pipe, another with a Tymbrel; one with a Harp, another with a Fiddle; so that the Musicians make sometimes several Essays before they can accommodate their Art to the Venom; but this is constant and certain, notwithstanding this Variety, that they all require the quickest and briskest Tunes, and are never moved by a slow dull *Harmony*.

While the *Tarantati*, or Affected, are Dancing, they lose in a Manner the Use of all their Senses, like so many Drunkards, do many ridiculous and foolish Tricks, talk and act obscenely and rudely, take great Pleasure in playing with Vine-Leaves, naked Swords, red Cloths, and the like; and on the other Hand can't bear the Sight of any Thing black; so that if any By-stander happen to appear in that Colour, he must immediately withdraw, otherwise they relapse into their Symptoms with as much Violence as ever.

It may afford some light towards understanding the Nature of this Poison, to observe that *Apulia* is the hottest Part of all *Italy*, lying Eastward, and having all the Summer long but very little Rain to temper the Heats, so that the Inhabitants, as one of that Country observes, do breathe an Air, as it were, out of a fiery Furnace; hence their Temperament is dry and austere, as appears by their being generally lean, passionate, impatient, ready to Action, quick-witted, very subject to inflammatory Distempers, Phrensies, Melancholy, and the like; upon which Account there are more mad People in this, than in all the other Parts of *Italy*; nay, what in other Countries is but a light Melancholy, arises here to a great Height; for Women in a *Chlorosis* do suffer almost the same Symptoms as Persons poisoned by the *Tarantula* do, and are cured the same Way; and in like manner the Venom of the *Scorpion* does here, in Effects and Cure, agree very much with that of this *Spider*.

From

From all this History it sufficiently appears, that those that are bitten by a *Tarantula*, do thereupon become *Delirious*; and that, in order to account for their surprizing Symptoms, the Nature of a *Delirium*, from which many of them proceed, ought to be understood.

Such is the Constitution of the *Humane Oeconomy*, that as upon the Impression of outward *Objects* made upon the *Organs*, and by the Fluid of the Nerves conveyed to the *common Sensory*, different *Species* are excited there, and represented to the Mind; so likewise upon this Representation, at the Command and Pleasure of the Soul, Part of the same Fluid is determin'd into the Muscles, and mixing with the arterial Blood there, performs all the Variety of voluntary Motions and Actions.

This Order has been always so constant in us, that at length, by a Kind of natural Habitude, without the Intervention of the reasoning Faculty, Representations made to the Mind do immediately and necessarily produce suitable Motions in the bodily Organs. When therefore these Representations are irregular, the Actions consequent to them must necessarily be so too.

This being premis'd, it may perhaps be probably said, that a *Delirium* is the Representation and various Composition of several *Species* to the Mind, without any Order or Coherence; together, at least most commonly, with irregular, or, as it were, undesign'd Motions of the Body; that is, such a wandering and irregular Motion of the nervous Fluid, whereby several Objects are represented to the Mind, and upon this Representation divers Operations performed by the Body, though those Objects are not impress'd upon the Organs, nor those Operations or Motions deliberately commanded by the Soul.

The Mind indeed is the first Principle of all muscular Motion; but in such Cases as these, its Promptitude to Action or Habit being so great, it is in a Manner surpriz'd, and cannot recover it self, after the Spirits are with violent Force determined pursuant to the Representation of the *Species*. For as, in the former State of Things, a Man is said to act rationally; so this latter Case is called a *Perturbation of Mind*, that is, a *Delirium*;

tho' it is very manifest, that in Reality the Defect is not in the *rational*, but *corporeal* Part; such *Species* being really presented to the Mind, upon which, by the Order of our Constitution, such Motions ought to follow in the Body.

Thus, for Instance, if the Liquor of the Nerves is, without the Presence of any Thing hurtful, put into a Motion like unto that which a painful Impression makes in it, the same bodily Actions must ensue as proceed from Fear, Anger, or the like Passion, determining the Spirits towards the muscular Parts; and a By-stander, who sees no Reason for such a Representation made to the Mind, will presently conclude that the Person thus acting acts without or besides his Reason, that is, is *Delirious*; especially if the Hurry and Confusion of the Spirits be such, that not only one, but several different *Species* be at the same Time presented to the Mind; for a Man in this Case may act the Part of one joyful, angry, timorous, or the like, without any appearing Reason, and all this almost in the same Moment of Time.

In one Word, *Deliria* are the *Dreams* of those who are awake; and as these in us sleeping are infinitely various, and wonderfully compounded, and all from the same common Cause, diversely pressing the Orifices of the Nerves, and thus making different *Repercussions* of their Fluid; and as we all know that this Confusion making the Representation of several *Species* to the Mind, there do hereupon follow, tho' the Body seem now at Rest and in perfect Repose, such Motions in the Organs as are usually the Effect of the arbitrary Determination of the Spirits thither; so we are now to inquire what Alteration of the Body, made by this Venom, can be the Occasion of this Disorder and Tumult in the nervous Fluid, which excites in the Party infected such surprizing, and almost contradictory, Representations.

Most of the Symptoms of those who are bitten by the *Tarantula* are at the first, that is, before they rise to a *Delirium*, plainly the same with those which the Bite of a Viper induces; without Doubt therefore, as we have before observed of the common Spider, that it pierces the Flesh with its hooked *Forceps*, and at the same Time intills from the *Proboscis* in the Mouth a liquid Venom into

the Wound ; so the like Claws in this, do serve to make Way for an active and penetrating Juice emitted from the same Part.

Of the Nature of which we may probably conjecture, that it is, when mixed with the Blood, being exalted by the Heat of the Climate, of so great Force and Energy, that it immediately raises an extraordinary Fermentation in the whole arterial Fluid, by which its Texture and *Crafsis* is very considerably altered; the Consequent of which Alteration, when the Ebullition is over, must necessarily be a Change in the *Cohesion* of its Parts, by which the *Globules*, which did before with equal Force press each other, have now a very differing and irregular *Nisus* or Action, so that some of 'em do so firmly cohere together, as to compose *Moleculæ*, or small Clusters; upon which Account there being now a greater Number of *Globules* contained in the same Space than before, and besides, the *Impulse* of many of these, when united together, differing according to the Conditions of their *Cohesion*, as to Magnitude, Figure, &c. not only will the *Impetus*, with which this Fluid is drove towards the Parts, be at some Strokes at least greater than ordinary; but the Pressure upon the Blood Vessels must be very unequal and irregular; and this more especially will be felt in them which are most easily distended; such are those of the Brain, &c. And hereupon the Fluid of the Nerves must necessarily be put into various *undulatory* Motions, some of which will be like unto those which different *Objects* acting upon the Organs or Passions of the Mind, do naturally excite in it, whereupon such Actions must follow in the Body, as are usually the Consequents of the several *Species* of Sadness, Joy, Despair, or the like Determinations of the Thoughts; and we shall readily pronounce one in this Condition, *Sad, Joyful, Timorous, &c.* and all without any apparent Reason or Cause; that is, in one Word, we shall say he is *Delirious*.

This is in some Degree a *Coagulation* of the Blood, which will the more certainly, when attended with an extraordinary Heat, as in the present Case, produce such like Effects as these, because the *Spirits* separated from the Blood thus inflamed, and compounded of hard, fix'd and dry Particles, must un-

avoidably share in this Alteration; that is, whereas their Fluid consists of two Parts, one more active and volatile, the other more viscid and glutinous, which is a Kind of Vehicle to the former; their active Part will bear too great a Proportion to the viscid, and thus they must necessarily be of more than ordinary Volatility and Force, and will therefore, upon the least Occasion imaginable, be irregularly determined to every Part; and hereupon will follow Tremblings of the Body, Anger or Fear upon a light or no Cause, extream Pleasure at what is but a trivial Entertainment, as Red or Green Colours, or the like; and on the other Hand, wonderful Sadness at any Thing not agreeable to the Eyes, as Dark and Black Things; nay, ridiculous Laughter, obscene Talk and Actions, and such like Symptoms; because in this Constitution of the nervous Fluid, the most light Occasion will make as real a *Reflex* and *Undulation* of it to the Brain; that is, will present as lively and vivid *Species* there, as the strongest Cause and Impression can produce in its natural State and Condition; nay, in such a Confusion, the Spirits cannot but sometimes, without any manifest Cause at all, be hurried towards those Organs, to which at other Times they have been most frequently determined; and every one knows which they are in hot Countries and Constitutions.

We must however here remember what in the former Essay we mentioned, of the Fluid of the Nerves being immediately altered by the venomous Juice.

It will perhaps make this Theory more than probable, to consider that *Baglivy*, in the Dissection of a *Rabbit* killed by a *Tarantula*, found the Blood Vessels of the Brain very turgid, and the Substance of the Brain it self, that is, the Beginning of the Nerves, lightly inflamed, and with livid Spots here and there, the *Lungs* and other *Viscera* distended, with concrete glotted Blood, and large Grumes of Blood with *Polypous* Branches in the Heart, a large Quantity of extravasated *Serum* upon the Brain, which is (as he takes Notice) mostly observed in those Subjects which died by a Coagulation of the Blood.

Neither is it amiss to remark, that in a *Chlorosis* there is nothing preternatural but

an *Infarctus* of the Arteries, and hence a retarded *Circulation*, from an Evacuation suppressed, and in this Country too much Heat; that is, a Beginning *Coagulation*, together with an inflammatory Disposition.

In short, *Bellini* has at large demonstrated, how *Deliria*, as well *Melancholic* as *Maniacal*, do proceed from a State of the Blood and Spirits not unlike to that I have here described.

But no less a Confirmation of these Notions may we have from the *Cure*; as to which it is observable, that the *Tarantati* have no Inclination to dance before they hear the Musick; for being ask'd to do it, they answer, It is impossible, they have no Strength.

As for the Reason therefore of their starting up at the first Noise of the Instrument, we must reflect upon what we have just now been saying concerning the Cause of the Motions of the Body in a *Delirium*; and consider withal, that muscular Motion is no other than a Contraction of the Fibres from the arterial Fluid, making an Effervescence with the nervous Juice, which, by the light Vibration and Tremor of the Nerve, is derived into the Muscle.

And thus we have a twofold Effect and Operation of Musick, that is, both upon the Mind and Body. For a brisk Harmony excites lively *Species* of Joy and Gladness, which are always accompanied with a more frequent and stronger Pulse, or an increased Influx of the Liquor of the Nerves into the Muscles, upon which suitable Actions must immediately follow; and if we remember what we before hinted, that People in this Country are sprightly and ready to Exercise, and that in such a State of the Fluids as we have describ'd, a slight Occasion presents as strong *Species*, as a greater can at another Time; the Influence of Musick on the Mind will appear to be so much the more powerful and certain.

As for the *Body*, since it is sufficient for the Purpose of putting the Muscles into Action, to cause those Tremors of the Nerves by which their Fluid is alternately dropped into the moving Fibres; it is all one whether this be done by the Determination of the Will, or the outward Impulsions of an *elastic* Fluid; such is the Air, and that

Sounds are the *Vibrations* of it, is beyond Dispute.

These therefore, rightly modulated, may shake the Nerves as really as the *Imperium Voluntatis* can do; and consequently produce the like Effects.

That this is so, besides what we shall add anon, we may be convinced by a Story which Mr. Boyle relates out of *Scaliger*, of a Knight of *Gascony* whom the Sound of a *Bagpipe* would unavoidably force to make Water; for this Secretion we know is regularly the Effect of an arbitrary Contraction of the Muscle of the Bladder.

The obstinate continuing of the *Tarantati* in this Exercise, is doubtless in a great Measure owing to the strong Opinion they have of receiving Advantage from it, being encouraged by the By-standers, and having always believed, and been told, that it was the only Cure in these Cases.

The Benefit from Musick is not only their dancing to it, and so evacuating by Sweat a great Part of the inflammatory Fluid; but besides this, the repeated Percussions of the Air hereby made, by immediate Contact shaking the contractile Fibres of the Membranes of the Body, especially those of the Ear, which being continuous to the Brain, do communicate their Tremblings to its Membranes and Vessels; by these continued Succussions and Vibrations, the Cohesion of the Parts of the Blood is perfectly broken, and its *Coagulation* prevented; so that the Heat being removed by Sweating, and the Coagulation by the Contraction of the muscular *Fibrille*, the wounded Person is restor'd to his former Condition.

If any one doubts of this Force of the Air, let him consider that it is in *Mechanicks* demonstrated, that the smallest Percussion of the smallest Body, can overcome the Resistance of any great Weight which is in Rest; and that the languid Tremor of the Air, which is made by the Sound of a Drum or Trumpet, may shake the vastest and strongest Edifices.

But besides all this, we must allow a great deal to the *determinate Force*, and particular *Modulation*, of these trembling Percussions; for contractile Bodies may be acted upon by one certain Degree of Motion in the ambient Fluid, tho' a greater Degree of it differently

qualified may produce nothing at all of the like Effect; this is not only very apparent in the common Experiment of Two String'd Musical Instruments tuned both to the same Height, the Strings of the one being struck upon, those of the other will sound, and yet a much greater Motion of the Air may not cause any sensible Vibration at all in the same Chords; but also by the *Trick* which many have of finding the Tone or Note peculiarly belonging to any *Wine Glass*, and by accommodating their *Voice* exactly to that Tone, and yet making it loud and lasting, they will make the Vessel, tho' not touch'd, first to tremble, and then burst; which it will not do if their Voice be but a little either too low or too high.

This last Consideration makes it no very difficult Matter to conceive the Reason, why different Persons, infected with this Venom, do require oftentimes a different Sort of Musick in order to their Cure, in as much as their Nerves and *distractile* Membranes have differing *Tensions*, and consequently are not in like Manner to be acted upon by the same Vibrations.

Nor are we to wonder at the Oddness of this Method and Practice; for *Musick*, although it be now-a-days applied to quite different Purposes, was anciently made great Use of for the removing of many, and those too some of the most difficult and obstinate Diseases.

For this we have a Famous Testimony in *Galen* himself, who tells us, That *Æsculapius* used to recover those in whom violent Motions of the Mind had induced a hot Temperament of Body, by Melody and Songs. *Pindar* mentions the same Thing, and indeed from hence not only the Notion, but the very Name of *Charming* seems to have taken its Origine. *Athenæus* relates, that *Theophrastus* in his Book of *Enthusiasm* says, *Ischiadic Pains* are cured by the *Phrygian Harmony*. This Sort of Musick was upon a Pipe, and the most vehement and brisk of all the Ancients knew; so that indeed it was said to raise those who heard it to downright Fury and Madness: And such we have observed to be required to the Venom of the *Tarantula*.

But what is besides in this last Authority very observable to our Purpose, is the Man-

ner of using this Remedy, and that was by *Playing upon the Part affected*, which confirms what we have just now advanced concerning the Effect of the *Percussion* of the Air upon the contractile Fibres of the Brain; for *Piping upon any Member of the Body*, cannot be suppos'd to do Service any other Way, than by such *Succussions* and modulated Vibrations as we before mentioned. And this indeed *Calius Aurelianus* agrees to, who calls this Practice, *Decantare Loca dolentia*; and says, that the Pain is mitigated and discuss'd by the Tremblings and Palpitations of the Part.

Aulus Gellius not only relates this same Cure of *Ischiadic Ails* as a Thing notorious enough, but adds besides out of *Theophrastus*, that the Musick of a Pipe rightly managed heal'd the Bites of Vipers.

And not only does *Apollonius* mention the Cure of Distractions of the Mind, Epilepsies, and several other Distempers, this same Way; but *Democritus*, in his Treatise of Plagues, taught, that the Musick of Pipes was the Medicine for most Diseases; which *Thales* of Crete confirmed by his Practice, when sent for by the *Lacedæmonians* to remove from them the Pestilence, he did it by the Help of Musick.

All which Instances do evince this Remedy to have been very ancient in many Cases; and indeed, as *Calius Aurelianus* takes Notice that the first Use of it was ascrib'd to *Pythagoras* himself; so he having settled and founded his Sect in those very Parts of Italy which are the Country of the *Tarantula*, going then under the Name of *Græcia Magna*, now *Calabria*; it is not, I think, at all improbable that he may have been the Author and Inventor of this Practice there, which has continued ever since: Especially since *Jamblichus* affirms, not only that he made Use of Musick in Physick, but particularly that he found out and contrived some Harmonies to ease the Passions of the Mind, and others for the Cure of Bites. But of Musick enough.

To conclude with this Poison, we may take Notice that, as to the Return of the Symptomes the next Year, that is owing to the same excessive Heat in those Months, acting again upon the small Remains of the venomous Ferment; thus *Bartholin* relates a Story of a Melancholy Physician at Venice, who

who suffer'd the Attacks of his Disease only during the Dog Days, which yearly ended and return'd with them: A convincing Proof how great a Share Heat has in all these Cases.

Of the Mad Dog.

MORE difficult and terrifying are the Symptoms from the Bite of a *Mad Dog*, whose Venom has this also surprizing in it, that the bad Effects do not appear oftentimes till the Cause of them is forgot; for the Wound is as easily cured as a common Bite is: But nevertheless, a considerable Time after, a melancholy Tragedy succeeds, sometimes sooner, sometimes later; for there are Instances of its being deferred to two, six Months; nay, a Year, and longer, tho' the Attack is generally within 40 Days after the Wound. About that Time, the Patient complains of running Pains all over his Body, especially near the Part wounded, like unto those in a Rheumatism, grows pensive and sad, prone to Anger upon little or no Occasion, with an intermitting Pulse, Tremblings and Contractions of the Nerves, with a great inward Heat and Thirst; and yet in a few Days (when the Disease is come to its Height) a Dread and Fear of Water, and any Liquor whatsoever, so that at the very Sight of it he falls into dismal Convulsions and Agonies, and cannot drink the least Drop; and this *Hydrophobia* or *Aqua Timor* has been always accounted the surest Sign and Mark of this Poison, as distinguishing it from all others.

The Ancients have at large described these Symptoms, as *Galen*, *Dioscorides*, *Actius*, *Aegineta*; but most particularly of all, *Calius Aurelianus*; and later Writers have given us several Instances of the *Hydrophobia*. Two Histories of it publish'd, the one by Doctor *Lifter*, the other by Dr. *Hornman*, I shall more especially take Notice of, and refer to, as containing the most exact and large Account of any I have met with: He that desires more, may consult the several Authors cited by that diligent Observer *Stalpart van der Wiel*.

That this Disease is accompanied with a *Delirium*, is almost the common Opinion both of Ancients and Moderns. *Democrates*

call'd it the barking Phrenzy; but Dr. *Lifter* agrees in this Point with *Petrus Salius Diversus*, and will not allow a *Delirium* to be the necessary Consequent of this Venom; and yet at the same Time he tells us, that his Patient barked like a Dog, and bit at the By-standers; that he threw into his Mouth what was given him more hastily and suddenly than it is natural or customary for Men to do.

From such Actions as these, together with those mentioned before in relating the Symptoms, it is obvious enough to conclude, that Persons thus affected are in a proper Sense *Delirious*; though at the same Time I do think, that the *Hydrophobia* it self (whatever is commonly believed) does not at all proceed from this *Delirium*, as will by and by appear.

I know indeed, that the main and plausible *Objection* against a *Delirium* is this, That the Patient himself does reason against his Timorousness, though he cannot overcome it, forewarns the Standers-by of his outrageous Fits, desires them to take care of themselves, and the like; which, from what I have already said concerning a *Delirium*, appears to be very consistent with it; nay, convinces that there is the greatest Degree of it in this Case, inasmuch as that it is not a Distemper of the Mind, but of the Body. And to this Purpose I remember to have seen my self an Instance of one in a Fever, who foretold some Time before any Signs of a *Delirium* were discover'd, how raving and unruly he should be, and made good his *Prognostick* to that Degree, that it was very hard Work to tame and master him; though (as he told me afterwards) he reason'd as much as he could against that groundless Jealousy of his Friends designing to murder him, which put him upon his mad Actions, but was not able to conquer the prevailing Species of Fear and Anger.

This *Delirium* therefore, as *Calius Aurelianus* says, proceeds entirely from an *Indisposition of the Body*, which is without all doubt owing to the Alteration made in the Blood by the *Saliva* of the *Mad Dog*, infill'd into the Wound inflicted by the Bite.

That we may rightly understand this, we must take Notice, that the *Rabies* or Madness in a Dog is the Effect of a violent Fever;

ver; and therefore it is most common in excessive hot Weather, though sometimes intense Cold may be the Cause of it: That no Dog in this Case ever sweats; from whence it follows, that when his Blood is in a Ferment, it cannot, as in other Creatures, discharge it self upon the Surface of the Body, and therefore must of Necessity throw out a great many *saline* and active Particles upon those Parts where there is the most constant and easy Secretion; and such, next to the *Miliary* in the Skin in us, are the *Salival* Glands. For this Reason much more Spittle is separated in a Dog when mad, than at any other Time, and that very frothy, or impregnated with hot subtile Parts.

Now as we every Day observe, that what is thrown out from Liquors in a Ferment, is capable of inducing the like Motion in another Liquor of the same Kind, when duly mix'd with it; so we may very well suppose in the present Case, that the *Saliva*, which is it self one of the most fermentative Juices in Nature, being turgid with fiery saline Particles thrown into it out of the boiling Blood, when it comes (by Means of a Wound) to be incorporated with the Arterial Fluid of any one, does by Degrees raise a preternatural Effervescence in it; the Effects of which will necessarily be most felt in those Parts which (being tender) are the least able to resist the Distention of the Blood-Vessels; such are the Stomach, and especially the Brain: And hereupon *Deliria*, with *maniacal* and such-like Symptoms, will easily ensue.

A Person thus affected may be said in a Degree to have put on the *Canine* Nature, (though his Reason be all this Time untouched and entire) may bite, howl, &c. because the like violent Agitation of the Blood in him as was in the Dog will present like *Species*, and consequently (so far as their different Natures will allow) produce like Actions; just as it has been observed, that *Sheep* bitten by a Mad Dog have run at the Shepherd like so many Dogs to bite him; so much can an Alteration of the Blood and Spirits do. And as a timorous Creature may be embolden'd, so we oftentimes see Persons courageous enough, by a Change made in the Blood by Evacuations, that is, by Want

of Force and Motion in that Fluid, made sheepish Cowards, in Despight of their Reason, so long as that Defect is continued.

But the main Difficulties in this Matter are, the Mischief discovering it self so long after the Bite, and the *Hydrophobia*.

As to the former, we are to consider, that Fermentation being a Change made in the Cohesion of the compounding Parts of a Fluid, it is sometimes a longer, sometimes a shorter, Time before this Alteration is wrought; which Variety may proceed, either from the different Nature and Constitution of the Ferment, or of the Liquor fermented, and a great Number of Circumstances besides; so that this Venom may be all the while doing its Work, though the Change made by it may not be to considerable as to be sensibly taken Notice of till a long Time after.

Nay, it may so happen, that the *Ferment* (being weak) may not raise in the Blood any remarkable Agitation at all, till some accidental Alteration in the Body unluckily gives it an additional Force; as we before observed how much external Heat concurs to heighten the Symptoms from the Bite of the *Tarantula*. And this probably may be the Case of those in whom this Malignity has not appear'd till six or twelve Months after the Wound.

That we may understand the Reason of the *Hydrophobia*, it is to be remark'd, that this Dread of Water does not come on till the latter End of the Disease, three or four Days before Death, that is, not till this preternatural *Fermentation* in the Blood is come to its Height; and as in the Dog, so in the Patient, a great Quantity of fermentative Particles is thrown off upon the Glands of the Mouth and Stomach, as appears by his Foaming at the Mouth, &c.

As also, that this *Fear* is not from a Sight of, or any imaginary Appearance in, the Water; for if the Vessel be close shut, and the Patient bid to suck through a Quill, as soon as he has tasted, he falls into Anguish and Convulsions, as Dr. *Lifter* observed. It is therefore highly probable, if not certain, that this surprizing Symptom proceeds from the intolerable Pain which any Liquor at this Time taken induces, partly by hurting the inflamed Membranes of the *Fauces* in

Deglutition, partly by fermenting with these active Particles discharged by the Blood upon the *Stomachic* Glands, and thus twitching and irritating the nervous Membranes; the very Memory of which *grievous Sense*, after it is once felt, is so terrible, that the affected Person chuses any Thing rather than to undergo it a second Time.

The Effects of this *Irritation* are manifest in the Convulsions of the Stomach, and frequent *Singultus*, with which the Patient is continually oppress'd. And we all know, by how necessary a Kind of *Mechanism* we do fly from and abhor those Things which have proved disagreeable to the *Animal Economy*, to which nothing is so contrary and repugnant as *Pain*; at the first Approaches of which, Nature starts and recoils, though Reason be arm'd with never so much Courage and Resolution to undergo the Shock.

Nor will any Body wonder how this *Ferment* should cause such *Torment*, who considers how often, even in *Colical Cases*, Persons are downright distracted by excessive Pain, from a Cause not unlike to this we are treating of, that is, from a corrosive Ferment in the Bowels, rarefying the Juices there into *Flatus*, and by this Means irritating and stimulating those tender Membranes into spasmodick and convulsive Motions.

And indeed Dr. Lister's Patient told him, that the very swallowing of his own Spittle put him to such Torture in his Stomach, that Death it felt was not so terrible as the inexpressible Agony.

It may serve both to illustrate and confirm this Theory, to take Notice, that not only may (according to these Principles) other Bites besides that of a *Dog* happen to induce the like Symptoms, [thus *Malpighi* relates a Story of a Mother made *Hydrophobia* by the Bite of her *Epileptic* Daughter] but that there are other Cases, without any Bite at all, which are attended with an *Hydrophobia*.

Thus *Schenkius*, *Salmuth*, and others, have observ'd a *Dread of Water*, without any Suspicion of a Bite, from *Malignant Fevers*. Now in these there is doubtless a hot putrid Ferment in the Blood; and it is no Wonder if Part of it be discharged upon the Throat and Stomach, which we do evidently find

in these Distempers to be more particularly affected by it, especially towards the latter End, from the *Aphtha*, *Singultus*, and the like usual Symptoms of a fatal Malignity.

Nay, *Hippocrates* himself seems more than once to have remarked something like this Symptom in Fevers, and to call those who were thus affected *Βεαχνητοι*, or Little Drinkers; for I cannot assent to Dr. Lister, (though *Celins Aurelianus* be on his Side) who thinks that the *Βεαχνητοι* are *Ταροφθοι* from the Bite of a Mad Dog, as well for other Reasons, as because *Plutarch* assures us, that the *Hydrophobia* and *Elephantiasis* were both first taken Notice of in the Time of *Asclepiades* the Physician, who lived in the Days of *Pompey* the Great, many Years later than either *Hippocrates* or *Aristotle*.

Of poisonous Minerals and Plants.

Although there be a great Variety of internal Poisons, as well *Mineral* as *Vegetable*, yet they do all of them seem to agree in their primary Effects, and Manner of Operation; and as the Teeth or Stings of *Venemous* Animals do constantly infuse a Juice into the Wound they make, by which the Mass of Blood is infected, so the Force of these is chiefly confined to the Stomach and *Prima Via*; and though it may in some Cases be communicated farther, yet the principal Mischief is done in these Parts.

Deleterious Medicines (says *Dioscorides*) are many, but the Alterations made by them in the Body common, and but few.

Of all this Kind, those of a *Mineral* Nature are the most violent and deadly, the greater Gravity and Solidity of their Parts giving to these a Force and Action surpassing the Mischief of *Vegetable* Juices; and therefore whereas noxious Plants do vary their Effects in different Creatures, so as to prove harmless, nay, perhaps beneficial and nutritive to some, (as *Henlock* they say is to Goats and Starlings, and *Henbane* to Hogs, the Strength of the Stomach in these Animals being sufficient to conquer and divide such corrosive Substances, and their Blood perhaps requiring to be recruited by such warm

warm and active Particles) a Mineral Malignity is not, at least so far as we know, conquerable by any, but becomes universally hurtful and destructive.

We shall here give the first Place to *Mercury Sublimate*.

This is no other than a Mixture of *Quicksilver* with *common Salt*. The Way of preparing it, as 'tis made at *Venice*, from whence great Quantities are sent into other Countries, *Tachenius* has given us in his *Hippocrates Chymicus*; as to which we must observe, that though there be always added a Proportion of *Salt-petre* and *Calcin'd Vitriol* to the other Ingredients, yet these do not enter into the Composition, but only serve to facilitate the Work; as abundantly appears from this Experiment, That *Mercury* sublim'd with the same Proportion of *Nitre* and *Vitriol* without *marine Salt*, neither receives any Increase of its Weight, nor acquires any malignant Quality.

The Effects of this *Poison* (when taken) are, violent griping Pains, with a Distention of the Belly, Vomiting of a slimy frothy Matter, sometimes mix'd with Blood, and Stools of the same, an intolerable Heat and Thirst, with cold Sweats, Tremblings, Convulsions, &c. as will appear from the following History.

To a large Dog was given a Drachm of *Mercury Sublimate*, mix'd with a little Bread: Within a Quarter of an Hour he fell into terrible Vomitings, casting up frequently a viscid frothy *Mucus*, every Time more and more bloody, and purged the same downwards; till tired and spent with this hard Service, he lay down quietly as it were to sleep, but died the next Morning.

The *Abdomen* being open'd, a great Quantity of extravasated Blood was found between the Liver and Stomach, and between the Duplication of the *Omentum* about the Stomach. The Guts as well as the Stomach were distended, and full of a frothy bloody *Mucus*: On the Outside they were of a livid Colour, within all over red, and inflamed down to the very *Rectum*. The fibrous Coat of the Stomach being taken off, between that and the nervous one, grumous Blood was found in several Places: The like was discover'd here and there in the Intestines between the same Coats.

The same *Symptoms* with these, and manifest Signs of a burning Corrosion, follow'd with *Ulcers* in the Bowels, *Baccius* observ'd in a young Man poison'd by *Sublimate*, mix'd with his Meat.

What we are here chiefly to examine is, how from Ingredients singly innocent and harmless so mischievous a Compound can result; for as the Case is very plain with respect to *Salt*, so is it likewise now notorious enough, that *Quicksilver* it self, which the Ancients, *Dioscorides*, *Galen*, *Pliny*, &c. have unjustly rank'd among Poisons, is in many Diseases (inwardly taken) of very safe and beneficial Use; and that not only when disguis'd with *Sulphur*, *Sugar*, &c. but crude, without any Correction, or vainly pretended Mortification.

This the *Arabian* Physicians first gave the Hint of, *Avicen* having observ'd, that *They who drink it in a large Quantity receive no Hurt, its Weight making a free Passage thro' the Body*. This was Encouragement enough for the Practice of giving whole Pounds of it in the *Iliac Passion*, which is oftentimes done with good Success, without any frightful Symptom accompanying the Advantage received from its Ponderosity.

Afterwards it plainly appeared, that this Mineral, tho' not taken in so great a Dose as could immediately force its Way thro' the Intestines, even when it was lodg'd for some Time in this or that Part, was not at all hurtful by any corrosive or malignant Quality: And *Fallopins*, *Brasavolus*, with others of great Note, confirm'd its harmless Efficacy in the Cure of the *Worms*, not only in adult Persons, but even in the more tender Constitutions of Children.

Nor are these the only Cases in which good Service may be had from this weighty Fluid. He that rightly considers the State of the Animal *Oeconomy*, the various Alterations it suffers from the Stagnation of its more viscid Juices in the smallest Canals, and how much the Impulse and Force of the Circling Blood, by which Obstructions are to be removed, must be increas'd by its carrying along with it such Particles as the *Mercurial Globuli*, will perhaps see good Reason to allow, that the prudent and cautious Management of *Quicksilver* may do that in some obstinate and dangerous Diseases, which

which we cannot promise our selves from any other of our known Medicines whatsoever.

But I am not to insist on this Head; and the Learned *Author* of the *New Theory of Fevers* has already most ingeniously explained the *Mechanism* by which such Effects as these are produced in the humane Body. It suffices to my present Purpose, to have proved that pure *Mercury* is not poisonous or corrosive; and therefore not only have I seen two Ounces of it given every Day for One and twenty Days together, without any Inconvenience at all, but found once some Quantity of it in the *Perinaum* of a Subject I took from the Gallows for a Dissection, (whose rotten Bones quickly discover'd what Disease it was had required the Use of it, and that I suppose chiefly in external Application by Uction) without any Marks of Corrosion of the Part where it was lodg'd.

Though withal we may upon this Occasion remark, that the extreme Quantity of this Mineral alone, however serviceable it may be in other Respects, yet when it happens in so great a Quantity to obstruct the Capillary Ducts, as that the Force of the Circling Fluid is not sufficient to wash it away, must necessarily induce Symptoms troublesome and bad enough, as *Spasms*, *Contractions*, *Palsies*, &c. which they do commonly experience, who have either been too often dawb'd with *Mercurial Ointments*, or for a long Time employ'd in rubbing the *Quicksilver* upon *Looking-Glasses*; for the internal Use of it will never produce any such Mischiefs.

As for *Sublimate* then, most certain it is, that the *saline* Particles do impart to the *Mercury* this malignant Quality; or, to speak more properly, that the *Salt* receives from the *Mercurial Corpuscles* such an Increase of its Gravity and *Momentum*, as renders its cutting Corrosion more effectual and penetrating; for the Manner after which this Matter is done is plainly this:

The *Globules* of the *Mercury*, though so minutely divided by the Action of the Fire, as to rise in the Form of a *Fume*, yet are still solid and ponderous Bodies: 'Tis all one to the present Purpose, whether we suppose them perfectly *Spherical*, or (with the Learned

Gulielmini) *Spheroidal*; for in both Cases, by reason of their extreme Parvity, being perhaps simple and elementary Bodies, they will easily be lodg'd in the Pores and Interstices of the *saline Crystals*; which being compos'd of the *Atoms* of *Salt*, variously by *Sublimation* combined and united, are a Kind of cutting *Lamellæ* or Blades; the Force of which could never have been very penetrating, upon the Account of their Lightness and easy Dissolution, if the *Mercury*, without blunting their Edge, or breaking their Figure, did not lend them an additional Weight, and thus at the same Time strengthen their Action, and prevent their quick Solution by the Juices of the Stomach; which cannot now disjoin their compounding Parts, because the Vacuities into which they should, in order to do this, insinuate themselves, are already possess'd and taken up by the *Mercurial Globules*.

In short, these *Crystals*, which are to be consider'd as so many sharp Knives or Daggers wounding and stabbing the tender Coats of the Stomach, and thus causing excessive Pains, with an Abrasion of their natural *Mucus*, and (upon the constant Sense of Irritation) continual Vomitings, &c. must of Necessity, sticking here and there in the Capillary Vessels, stop the Passage of the Blood in several Places, whereupon it stagnates, and there follow little Inflammations, which growing higher and higher, terminate quickly in perfect Ulcers and Gangrenes; and these, though singly very small, yet many in Number, do all together make up one continued and incurable Mortification.

This being the Nature of *Sublimed Mercury*, it may not be amiss to enquire, how it comes to pass, that this same Compound resublim'd with *live Mercury* in the Proportion of four Parts to three, (for the *Sublimate* will not take up an equal Quantity) especially if the Work be repeated three or four times, loses its Corrosiveness to that Degree, as to become not only a safe, but in many Cases a noble, *Medicine*; for I do not see that any of the Chymical Writers have hit upon the true Solution of this *Phenomenon*.

Here then is to be consider'd, That the Action of the *saline Crystals* depending upon their Solidity and Largeness, these must

must necessarily, by every subsequent Sublimation, be broken into smaller and smaller Parts; the *Mercurial Globules* (for the Reasons given by the Author of the fore-mentioned *Theory of Fevers*) arising more quickly and easily than the *Salts*, quit the Interstices in which they were lodg'd, and the *Crystalline* Blades are divided every time more and more by the Force of the Fire, whereupon a new Combination of Parts succeeds; and although there be a greater Proportion of the *Mineral* to the *Salts* than before, which makes *Dulcified Mercury* specifically heavier than the *Corrosive*, yet the broken Pieces of the *Crystals* uniting into little Masses of differing Figures from their former Make, those cutting *Points*, which were before so sharp, are now either quite lost, or at least, by reason of their Bluntness, cannot make Wounds deep enough to be equally mischievous and deadly; and therefore do only vellicate and twitch the sensible Membranes of the Stomach to that Degree, as excites them to an Excretion of their Contents and glandular Juices, upwards or downwards, according as the Force of Irritation is greater or less.

Thus a violent *Poison* is mitigated into a *Vomit* or *Purge*; nay, it may easily happen, (especially in robust Constitutions, and if the Bowels be at the same Time by any Means defended against the Stimulating Power of the Medicine) that this Twitching may be so slight, as to be almost insensible, and hardly troublesome; and then the *Mercurial Globules*, being freed indeed from most of the *saline Parts* in their Passage through the *Primæ Viæ*, but still having a Mixture of some few of them, are quickly convey'd into the Blood, where, by their Motion and Weight, they must necessarily dissolve the preternatural Cohesions of all the Liquors, particularly of those which circulate in the smallest Canals, and are most viscid and tenacious, making them more fluxile and thin, or of more easy Secretion; whereupon all the Glands of the Body are as it were set to work, and scoured of their Contents; but the *Salival* ones especially, being many in Number, very large and wide, and the Juice they separate of a tough and ropy Substance, so that a considerable Quantity of it is accumulated before it is forced out at the Ori-

fices of the Ducts, these Effects will be most remarkable in *them*, and a *Salivation* or Spitting must continue so long, till the active Mineral Particles are through these and the other Passages discharged out of the Body.

As the Difference between *Mercury Corrosive* and *Dulcified* lies in a greater and lesser Degree of Operation and Force, so this same Consideration distinguishes the several *Preparations* of this Mineral from each other; which, though very many, yet do all vary their Effects in the Body, only according as the *Mercurial Globules* are differently combined with *Salts*, and the *Points* of *these* more or less broken by the Action of the Fire, in the burning of Spirits upon them, and such-like Managements: And therefore however dignified with the great Names of *Arcana*, *Panacea*, *Princes Powders*, &c. they do not afford us any Thing singular and extraordinary, beyond what we may with equal Advantage promise our selves from some or other, of the most common and usual *Processes*.

We may also fairly conclude from this Reasoning, that the safest Way of raising a *Salivation* is by *internal* Medicines; since whatever Mischiefs can be apprehended from *these*, may in a greater Degree follow from the *external* Use of *Mercury*; not only because, as we have already hinted, the *Mineral Globules*, being intimately combined with *Salts* in the several Preparations given inwardly, will (by the Irritation of *these*) be easily and fully thrown out at the Organs of Secretions, till the Blood is quite discharged of its Load; whereas, in all the Dawblings with *Mercurial Ointments*, we can never be certain that none of the heavy Particles are left lodg'd in the *Interstices* of the *Fibres* or *Cells* of the *Bones*; but also, inasmuch as (by computing the Portion of *Mercury* in all the Doses necessary to promote a Spitting, and the Weight of the same Mineral usually applied when this is done by *Unction*) it will appear, that the Quantity in the latter Case vastly exceeds that in the former, and consequently that the Inconveniencies to be feared will be in the same Proportion.

Therefore this external Management of *Mercury* is only to be allow'd of, where either the Case will bear the Violence of such a Me-

Method, or outward Ulcers and Tumours require a particular Cure by Liniments, &c.

Nor is it improper to remark, that we do hereby see how the Use of this Mineral comes to produce that Effect so often complain'd of, (though not always with Reason) of making the Bones foul or carious; for if the *Lamina* or *Fibres* of these are already so much broken and spoiled by a Disease, as that the Circulation of the Fluids through them can't be maintain'd, they must necessarily be corrupted more by the Weight of the *Mercurial Globules*; though here also it is plain, that the outward Use of this Remedy will be more to be blamed than the inward.

And indeed, as the earliest Use of *Mercury* was in *Unguents* and *Emplasters*, so most of the Prejudices and Outcries against it are owing to Effects produced this Way: For the first Attempts of the Cure of *Venerical Maladies* by this Remedy were learn'd from the *Arabians*, who (having recommended *Mercurial Ointments* in the *Lepra* or *Scabies*) gave a Handle to the *Italian Physicians* to try their Efficacy in removing the Foulness of the Skin from a new and terrible Contagion: Neither were they sparing of their Liniments, which they continued to rub in for 12, 15, nay, sometimes for above 30 Days together; so that it is no Wonder if they often met with very untoward Symptoms from so severe a Treatment, and if (as some of them do affirm) they now and then found *Mercury* in the rotten Bones of their Patients, who had (it may be) suffer'd too much both from their Disease and their Physician.

Thus much of *Mercury*. Let us in the next Place examine *Arsenick*, about the Nature and Composition of which Authors are very much puzzled.

This in short is either *Native* or *Factitious*, and each of three Sorts, *Yellow*, *Red*, and *White*. The *Native Yellow* is what the *Latins* call'd *Auripigmentum*; and this *Olaus Wormius* makes threefold. The *Red* is the *Sandaracha* of the *Greeks*. The *White* was not known to the Ancients; and indeed *Theophrastus* seems only to have known the *Red*; but *Dioscorides* describes both *Red* and *Yellow*. *Nicander* had no Knowledge of either; the

only Mineral Poisons he mentions are *Litharge* and *Cerufs*.

Orpiment and *Sandaracha* differ only by their greater or lesser Concoction in the Earth; and therefore from *Orpiment* boiled in a close Pot five Hours in a Furnace Fire, is made the *Factitious Sandaracha* as perfect as the *Natural*.

The *Factitious Yellow* is made from the Crusts of the *Natural Orpiment*.

The *Native White* is more rare, but found plentifully in some Silver Mines in *Germany*.

But the *White Factitious* is of the most common Use of all; and it is, as *Agricola* tells us, no other than *Orpiment* again and again sublimed with an equal Part of *Fossile Salt*, till it is brought to a Whiteness.

Orpiment and *Sandaracha* are mostly found in Mines of Gold; and all Metallick Writers do agree them to be the best Signs of the Richness of the Vein. This is Ground sufficient for the *Chymists* to take *Arsenick* for the Subject Matter of their great Work, as they call it; and they have very fondly accommodated some Enigmatical Lines in the *Sibylline Oracles* to this Mineral. Tho' their Interpretation be strain'd, and not fairly made out, (the *Author* of the Verses, whatever he might mean, being indeed discoursing of the Name of the *Divine Power* itself) yet very true it is, that this great Expectation from *Arsenick* is as old at least as *Caligula*, that is, of more ancient Date considerably than the far greatest Part of those suppositious and ill-contrived Compositions which do now bear the Name of *Oracles*; for that covetous Emperor, as *Pliny* relates, order'd a great Quantity of *Orpiment* to be wrought upon, that he might extract Gold out of it, and made some; but as it usually happens in such-like Attempts, the Quantity did not answer the Expence.

It is more to our Purpose to take Notice, that the later Pretenders to this Philosophy, by finding their three Principles, *Salt*, *Sulphur*, and *Mercury*, in this Body, will lead us into its true Nature and Composition.

For whether we take *Orpiment* or *Sandaracha*, either of them will afford a *Regulus* or *Mercurial Substance* more pure than that of *Antimony*. The Manner of extracting it

L'Emery has taught; and to this indeed the Mineral owes its great Ponderosity.

The Inflammability and Smell of *Arsenick* are sufficient Proofs of its abounding *Sulphur*, which may without much Difficulty be separated from it.

That it consists of some *saline Parts*, we are assured by its Solution in common Water; and it is upon the Account of these that it does more happily promote the *Flowing* of Metals than any other *salt Powders* which the Workmen make use of; wherefore some have call'd it a coagulated *Aqua Fortis*.

From all this it appears, that Authors do vainly dispute wherein the noxious Quality of *Arsenick* resides, since the Case here is plainly much the same with that of *Sublimate Corrosive*; and as the Salts there, together with the Mercurial Particles, do compose pungent *Crystals*, so without all doubt the *Regulus* of this Mineral gives a like Force to the *saline Bodies*, which without this Weight could be but of small Effect. The main Difference is, that in *Arsenick* we have an Addition of *Sulphur*, which does not only strengthen the Action of the other Parts, in that as a *Vinculum* it keeps them united together, but (consisting besides of many hot and fiery Corpuscles) promotes the Inflammation of those Wounds which the Crystalline *Spicula* make in the Membranes of the Stomach.

Upon the Score of such a Texture and Make as this, *Arsenick* makes no Ebullition either with *Alcalies* or *Acids*: And as the *Regulus* of it, being cleared from most of its Salts, is by much less hurtful than the crude Mineral it self; so on the other Hand, the *Fastidious White*, in which there is a much greater Proportion of the saline to the metallick Parts, is the most violent of all the Kinds, superior in Force to *Mercury Sublimite*.

The several Histories related by *Wepfer* do put this out of Question; it is sufficient to our Purpose to mention one.

A Dog, having eat some Fat mix'd with *White Arsenick*, died the next Day. The upper Part of the Stomach (when open'd) was red and inflamed, the Coats thinner than ordinary, the Bottom of it was cover'd with a foetid Slime, and some Pieces of Fat; the

thin Guts were so corroded as to be per-
vious in three Places, two of the Ulcers so large that they would easily admit a *Bean*. The Cavity of the *Abdomen* contain'd a yellowish *Ichor* tinged with Blood.

The Case being thus, one would wonder what should induce Authors to prescribe so corrosive a Mineral to be worn upon the *Pit* of the Stomach as an *Amulet* against the Plague. This Trick we may well believe to be dangerous, when *Lionardo di Capo* tells us of a Child kill'd by a violent Vomiting and Purging, occasioned from a slight Wound made in the Head by a *Comb* wet with Oil in which *Arsenick* had been infused; for the Pores of the Body being open'd by Heat and Exercise, some of the noxious *Effluvia* may easily insinuate themselves into the Part. Accordingly *Crato* observ'd an Ulcer of the Breast caus'd by this Application; *Verzascha*, violent Pains, and fainting Fits; *Diemerbroeck* and *Dr. Hodges*, Death it self.

The Truth of the Matter is, this Practice seems to owe its Origine to a Mistake: Some of the *Arabian* Physicians had commended *Darsini* worn in a Bag for a Preservative in Plague-time. This in their Language signifies *Cinnamon*. But the *Latin* Interpreters retaining the same Word in their Translations, (as was frequently done) one or other afterwards, not understanding its Meaning, and deceived by the Likeness of the Sound, substituted in its Place *De Arsenico*, as if *Darsini* were all one with *Zarnick*. The Authority of the first Author serv'd to propagate the Error: Nor were those wanting who reason'd upon the Matter, and found it agreeable to their Philosophy, that this Mineral should draw to it self and concentrate the *Arsenical Effluvia* out of the Air, and thus secure the Body from their Infection, these being (as they imagined) the common Cause of Pestilential Diseases.

Having thus particularly discours'd of the Nature of these two Poisons, I shall not need to insist upon any more out of the *Mineral Kingdom*.

All of them bear some Analogy to the former, and are more or less dangerous, according as their *Salts* receive a differing Force from the metallick Particles. For this Reason, as we have observ'd that the most virulent may be mitigated by breaking the

Points of the Saline Chrystals; so on the other Hand, the most innocent Minerals may become corrosive, by combining them with *Salts*, as we see in the several Preparations of *Silver, Antimony, Iron, &c.*

Poisonous Plants.

TO Proceed therefore to *Vegetables*: The most notorious of these for Venomous Juices among the Ancients were *Cicuta* and *Aconitum*.

Our *Oenanthe Sicula Facie, Succo viroso*, which *Wepfer* has described by the Name of *Cicuta Aquatica*, and of the dismal Effects of which in some Children, who by Mistake did eat of it, he has wrote a large Volume, was very probably the *Cicuta* so much in Use of old, especially at *Athens*, for Killing. At least the Violence of this makes it a much fitter Instrument of Death than the common *Hemlock*, which is not by far of so malignant a Quality.

Tho' we must withal allow differing *Climates* very considerably to heighten or abate the *Virtues of Plants*. And it is not altogether improbable, that the Poison with which the *Athenians* took away the Lives of Malefactors, was an inspissated Juice compounded of that of *Cicuta* and other corrosive Herbs.

But be this as it will, the Alterations which *Wepfer* observed the Roots of *Oenanthe* to make in the Body, were a violent Pain and Heat in the Stomach, terrible Convulsions, with the Loss of all the Senses; Distortion of the Eyes, and flowing of Blood out at the Ears; the Mouth so fast shut, that no Art could open it; Efforts to vomit, but nothing thrown up; frequent Hiccoughs, with a great Distension and Swelling, especially at the Pit of the Stomach; and when Death had concluded the Tragedy, a continued Running of green Froth at the Mouth.

Stalpart van der Wiel gives us the like Account of two Persons kill'd at the *Hague* by the same Roots.

In a *Dog*, who for Experiment's Sake died by this *Poison*, the Stomach when opened was found quite *constringed*, and shut up at both *Orifices*, its inward Surface red, with livid Spots here and there; the Intestines were

empty, only the *Rectum* contained a little greenish *Mucus*.

Thus it appears, that this Plant consists of hot, acrid and corrosive Parts, which by rarefying the Juices of the Stomach, and wounding its nervous Membrane, are the Cause of all those Disorders which do immediately follow.

For upon the Sense of a violent *Irritation* and *Pain*, the Fluid of the Nerves is presently in large Quantities determined to the Part affected; and this, if the *Stimulus* be not over great, will be only to such a Degree as is sufficient, by contracting the Fibres of the Stomach, and Muscles of the *Abdomen*, to throw off the Cause of the disagreeable *Sensation*; but the uneasy *Twitching* being too terrible to be born, the Mind, by a Kind of Surprise, does with *Haste* and *Fury* as it were command the Spirits thither: Thus the Business is over-done, and the Action of the Fibres becomes so strong, that the Orifices of the Stomach are quite closed; so that, instead of discharging the noxious Matter, the *Torment* is made greater, and the whole *Oeconomy* put into Confusion.

This forcible Contraction of the Muscles was the Reason that one of the Children which *Wepfer* saw, made *Urine* in the Midst of the Agony, to the Height of Five or Six Foot, with a Strength and Violence surprising to the Spectators.

Nor is it any Wonder, if in these *Circumstances* all Sense be lost, Blood gush out at the *Ears, Nostrils, &c.* the Parts being all torn and broke by the Violence of the *Convulsions*; which tho' they began in the Muscles of the Belly, must at last prevail in the Members too, till the whole *Fabrick* is shock'd and overturn'd; and some of the *corrosive Salts* perhaps getting into the Blood, and by the Rarefaction of it distending the Vessels, the membranous Coats of which being already overstretched, will the more easily give Way, and let out their Fluid.

The Case of *Aconitum* is much the same; this is our *Napellus* or *Monkshead*, and its Effects do so nearly agree with those now related of *Oenanthe*, that I shall not need to recite them; the Experiments of *Wepfer* are full and convincing. And indeed, as all the *Histories* which this same *Author* has so carefully given us of Trials made with several

Vege-

Vegetable Poisons, *Solanum*, *Nux Vomica*, *Coculus Indicus*, &c. on different Creatures, do put it out of all Doubt, that the common Mischief of these is a Twitching and Inflammation of the Stomach; so it appears from hence, that *Virulent Plants*, although they may be distinguished even from one another by particular *Virtues*, do however kill by a like Operation and Force, which differs chiefly in Degree from that of noxious Minerals.

And therefore in order to know what the *specifick Qualities* of any such *Herbs* are, they must be given only in very small *Doses*; and then perhaps it would appear, that they are not made (as some do imagine) to be deleterious and destructive, but for very good and beneficial Uses; as we do particularly experience in the Case of *Opium*.

Nor is it at all strange, that the *Symptoms* from a *Vegetable* and from a *Mineral Virulency* should be so different, although of the same Kind, and only of unequal Force; for the more solid Parts of *Minerals*, eroding the Coats of the Stomach, induce a perfect Mortification and Gangrene, and thus do their Work at once; whereas the weaker Salts of *Plants* can make but a slighter *Excoriation*, upon the painful Sense of which those Agonies and Convulsions that follow do rather gradually exhaust the Strength, and thus the Animal is not kill'd so speedily, nor with the same *Appearances*.

Upon this Score, tho' Mineral Poisons do not pass the *Prima Via*, Vegetable Ones in some Cases possibly may; just as we find those Medicines which have a great Degree of Irritation presently to induce a *Vomiting*, whereas the same *Twitching* a little weaken'd suffers them to pass into the Intestines, and work downwards by Stools.

By this we may perhaps give some Guess at the Nature of those *Poisons*, with which they tell us the *Natives* in some Parts of *Africa* and *India* are so expert at Killing, that they can do it in a longer or shorter Time as they please. These are most probably either the *Fruits*, or the inspissated *Juices* of corrosive Plants, which inflaming the Bowels, may cause little Ulcers there, whose fatal Consequences, we know, may very well be slow and lingering.

This I am the rather induced to believe, because an ingenious *Surgeon*, who lived in *Guinea*, told me, that the *Antidote* by which the *Negroes* would sometimes cure those who were *poisoned*, was the *Leaf* of an *Herb* which purged both upwards and downwards. For by this Means the Stomach might be cleared from the adhering corrosive Parts of the Venom. Yet I can hardly think it possible at the same Time that they should be able, by varying the Composition or Quantity of the *Dose*, to ascertain the Time in which it shall kill, to a Week, Month, &c. nor indeed have I ever met with any Person who could attest this to be Matter of Fact.

Though repeated Trials and Observations may help one well practised in such Tricks to give notable Conjectures in this Point.

The Ancients indeed pretended much the same Thing with their *Aconitum*, of which they seem to have made a Kind of Secret and Mystery; as we learn from *Theophrastus*, who says, *The ordering of this Poison was different, according as it was designed to kill in two, three Months, or a Year*. But this he relates only as a common *Tale* or *Opinion*, and not as a Story to which himself gave any Manner of Credit.

It is very plain, that the common Cure of all Poisons of this Kind, must be by freeing the Stomach, as soon as possible, from the corrosive and vellicating Particles, and defending the Membranes from their Acrimony, by such Things as are of a smooth, oily, and lubricating Substance.

Of Venomous Exhalations from the Earth, Poisonous Airs, and Waters.

BESIDES these already treated of, there is yet another Way of being *Poisoned*, and that is, by *Venomous Steams* and *Exhalations*, or a *Poisonous Air* taken into the Body by the Breath.

This is notorious enough, and Authors do upon many Occasions make Mention of it; but when they come to explain the particular Manner how this kills, they most commonly reduce it to some of the *Poisons* which prove

prove destructive by being admitted into the Stomach, alledging that malignant Fumes and Airs are therefore fatal, because impregnated with *Arsenical*, *Mercurial*, and the like deleterious *Miscum* or Particles, they do convey these into the Blood; which being of a very corrosive Nature, must necessarily do Hurt both to the fluid and solid Parts.

And indeed that the Fumes of these same Minerals are very pernicious, and Air fill'd with their Atoms very unfit for Respiration, is most certain; but to argue from hence, that all deadly Vapours and malignant Airs owe their Mischief to these only, is too fond and ill-grounded a Conceit; since upon a due Enquiry it will appear, that there may be, and are, *Mortiferous Exhalations* from the Earth, infecting the Air, of a Nature so different from any of those Poisons, that the very Substance from which they arise may not be at all hurtful, tho' taken into the Stomach it self.

Venomous Steams and Damps from the Earth, the *Latins* in one Word called *Mephites*.

This, as many other *Tuscan* Words, comes from a *Syriac* Theme, which signifies to blow or breathe.

And in ancient Times several Places were notorious for them; so the *Mephitis* of *Hierapolis* was very famous, of which *Cicero*, *Galen*, but more particularly, and from his own Sight and Knowledge, *Strabo* makes Mention.

Such another was the *Specus Corycicus* in *Cilicia*, which upon the account of its stinking deadly Air, such as is thought to proceed from the Mouth of *Dragons*, which the Poets give to *Typhon*, was called *Cabile Typhonis*. This *Pompon. Mela* describes, and it is indeed as ancient as *Homer*; for *Arima*, in which he places it, was, as *Eustathius* says, a Mountain of *Cilicia*.

Neither are such Fumes as these unfrequent now-a-days, and though mostly taken Notice of in Mines, Pits, and other subterraneous Places, yet they are sometimes met with in the Surface of the Earth too, especially in Countries fruitful of Minerals, or pregnant with imbowelled Fires; such are *Hungary* and *Italy*, which latter (as *Seneca*

observes) has always been more than any other remarkable for 'em.

I shall therefore, having had the Opportunity of making some Remarks upon One the most famous of all in those Parts, give as good an Account as I can of that, and its Manner of Killing; which tho' I dare not affirm to be universally applicable to any *Mephitis* whatsoever, yet seems plainly to be the Case of most of 'em; and where it is not, this simple Mischief will only be found to be complicated with another; and then some extraordinary Symptoms or Appearances in the Animals kill'd, will easily make a Discovery of the additional Venom and Malignity.

This celebrated *Mofeta*, taken Notice of (or at least some other hereabouts) even in the Time of *Pliny*, is about two Miles distant from *Naples*, just by the *Lago d' Agnano*, in the Way to *Pozzoli* or *Puteoli*, and is commonly called, *La Grotta de Cani*, because the Experiment of its deadly Nature is frequently made upon *Dogs*; tho' it be as certainly fatal to any other Animal, if it come within the Reach of its Vapour; for *Charles the Eighth of France* prov'd it so upon an *Ass*; and two *Slaves* put into it by Order of *D. Pietro di Toledo*, Viceroy of *Naples*, with their Heads held down to the Earth, were both kill'd.

'Tis a small *Grotta* at the Foot of a little Hill, about Eight Foot high, Twelve long, and Six broad: From the Ground arises a thin, subtle, warm Fume, visible enough to a discerning Eye, which does not spring up in little Parcels here and there, but is one continued Steam, covering the whole Surface of the Bottom of the Cave, and has this remarkable Difference from common Vapours, that it does not, like Smoak, disperse it self into the Air, but quickly after its Rise falls back again, and returns to the Earth; the Colour of the Sides of the *Grotta* being the Measure of its Ascent; for so far it is of a darkish Green, but higher, only common Earth, and this is about Ten Inches. And therefore as my self found no Inconvenience by standing in it; so no Animal, if its Head be kept above this Mark, is in the least injured: But when (as the Manner is) a Dog, or any other Creature, is forcibly held below it,

it, or, by reason of its Smallness, can't hold its Head above it, it presently, like one stunned, loses all Motion, falls down as dead, or in a Swoon, the Limbs convuls'd and trembling, till at last no more Sign of Life appears, than a very weak and almost insensible Beating of the Heart and Arteries, which, if the Animal be left there a little longer, quickly ceases too, and then the Case is irrevocable: But if snatch'd out, and laid in the open Air, soon comes to Life again, and sooner, if thrown into the adjacent Lake.

In this short, but accurate, History of the *Grotta de Cani*, I have set down those Particulars, which do not only distinguish *Mephitical* Exhalations from common and innocent Fumes, but also give Hints sufficient, I think, mechanically to determine the Reason and Manner of their surprizing Effects.

And not to spend Time in refuting the Opinions of others, I shall only take Notice, that here can be no Suspicion of any true *Venom*, or real Poison; if there was, it were impossible that Animals taken out of the *Grotta*, should so immediately recover the Effects of it, without any remaining Appearance of Faintness and Sicknels, or such like Symptoms as those suffer who have been breathing in an Air impregnated with malignant corrosive *Effluvia*. Besides that, the Venomous Corpulcles would certainly, in some Degree at least, infect the Air in the upper Part of the Cave, which continues pure, and fit for Respiration. Neither indeed, after what Manner soever this Poison be imagined to act, whether by dissolving or coagulating the Blood, could its Efficacy be so sudden and momentaneous, without some Marks of it in the Creatures kill'd, when opened, which yet do discover nothing of this Nature extraordinary, neither in the fluid, nor in the solid Parts.

In order therefore to understand wherein this deadly Quality consists; I say in the first Place, that Life, so far as it respects the Body, is, in one Word, the *Circulation* of the Blood; that is, its Motion in *conical* distensible Vessels from the Heart to the extreme Parts, and its Return to the Heart

again by the same Canals inverted; for 'tis upon this that all animal Functions, all Sense and Motion, voluntary and involuntary, do depend; so that the Regularity of this Course is the Measure of Health, or the most perfect Life, as its various Irregularities are the Occasions of Sicknels and Diseases, or a beginning Death.

Now all the animal Operations and Offices which proceed from this Circulation, are the Effects of several Secretions of Liquors of very different Natures out of the same fluid Mass; it was therefore absolutely necessary that the Blood, before it be distributed to the Organs, should be so comminuted and broken, as that no Cohæsion of its Parts should hinder the Separation of these *Juices* from it, when it arrives with a determinate Force at the Orifices of the Secretary Vessels.

This Work is done in its Passage through the *Lungs*, by the repeated Compression of the Air in those *Bladders* upon the Arteries, with wonderful Contrivance dispers'd among 'em. Herein lies the Use and Necessity of *Respiration*, and the sudden Mischief of stopping it, in that the whole Mass of Blood being to pass this Way, upon a Check here, there presently ensues a Stagnation, that is, a Cessation of all animal Functions, or Death; which will be the more speedy, if not only no Air is inspired, but a Fluid of a quite different Nature from it succeeds in its Place.

Wherefore it must be observed, that this good Effect of the Air is performed by its *Elasticity*; and that no Fluid whatsoever, that we know besides, is *elastic*, at least to any considerable Degree; that is, has a Faculty of expanding and dilating it self when compressed: No, not *Water*, as near as that is thought to approach to Air in its Nature.

And now as to the present Case, I took Notice before that this *Vapour* is one continued and uninterrupted *Steam*, and that quickly after its Rise, it falls down again; that is, that it has little or no Mixture of Air with it, or no Elasticity; and is, on the other Hand, very heavy, when forsaken by the Force of *Heat* that drove it upwards.

So that I make no Question, but that Animals in this Place do, instead of Air, inspire *Mineral Fumes*; that is, a thin watery Vapour, impregnated with such Particles as do, when united together, compose solid and heavy Masses; which is so far from helping the Course of the Blood through the Lungs, that it rather expels the Air out of the *Vesicula*, and straitens the Passage of the Blood Vessels, by its too great Gravity; whereupon the *Bladders* are relaxed and subside, and the Circulation is immediately interrupted. But if the Animal be in Time removed out of this *Steam*, that small Portion of Air which does, after every Expiration, remain in the *Vesicula*, may be powerful enough to drive out this noxious Fluid; especially if the Head of the Creature be held downwards, that so its Gravity may forward its Expulsion; or it be thrown into Water, which by assisting, upon the Account of its Coldness, the Contraction of the Fibres, promotes the retarded Circle of the Blood; as we every Day experience in a *Deliquium Animi*, or Swooning Fit.

Tho' if this Stagnation be continued too long, no Art can renew Life, no more than in One perfectly strangled; nor will the *Lake of Agnano* it self be of any Service; which shews, that there is no singular Virtue in that Water beyond any other; nor is it, as some have fondly imagined, a peculiar Antidote for the Poison of the *Grotta*.

The bad Effects of such *Fumes* as this will be the more certain, because the inspired Mineral Particles twitch and irritate the Membranes, which are hereupon contracted to that Degree, as not to be able to recover their Tone, and so the Force and Action of the *Lungs* is quite lost.

It appears from all this not to be at all necessary to make any farther Enquiry into the particular Nature of these Mineral Particles, since they do in this Case act chiefly by their Gravity, which is common to em all. Tho' indeed the *Greenish* Colour of the Earth, together with its *Sabacid* Taste, very much (as *L. di Capoa* observes) like to that of the *Phlegm of Virriol*, seem to declare them, if not altogether, yet principally at least, to be *Virriolick*.

To conclude this Part of our Discourse; I think it a sufficient Confirmation of this Reasoning, that in *Frogs* kill'd in this *Grotta*, the *Bladders* of the Lungs (more visible otherwise and distinct in these Creatures than in most others) were found subsided, and quite empty of Air. But if any one desires a farther Proof, he may, according to these Principles, make (as *Lionardo di Capoa* did) an artificial *Mephitis*; for if *Antimony*, *Bismuth*, or any other such Mineral, be finely powdered, and moisten'd with *Aqua Fortis*, or *Spirit of Nitre*, there will arise a great Heat, and a thick dark Smoke, in which, as in the *Grotta de Cani*, Torches are extinguish'd, and Animals, though but slowly, stifled and kill'd. And this Effect will be more sensible, and equal to the most violent *Mephites*, if the *Antimony* or *Marcassite* be mix'd with *Bitumen*, and the *Spirit of Nitre*, or *Aqua Fortis*, intirely depurated from all its *Phlegm*.

And thus I have shewn how Death may enter at the Nostrils, tho' nothing properly *Venomous* be inspired. It were perhaps no difficult Matter to make it appear, how a lesser Degree of this Mischief may produce Effects, tho' seemingly very different from these now mentioned, yet in Reality of the same pernicious Nature; I mean, how such an Alteration of the common Air as renders it in a Manner *Mephitical*, that is, increases its Gravity, and lessens its Elasticity, (which is done by too much Heat, and at the same Time too great a Proportion of watery and other grosser Particles mix'd with it) may be the Cause of *Epidemic* Diseases, and, it may be, more especially of those which, by reason of their untoward Symptoms, are usually called *Malignant*.

For it is very remarkable, that *Hippocrates* observ'd the Constitution of the Air, which preceded *Pestilential* Fevers, to be great Heats, attended with much Rain and Southern Winds; and *Galen* takes Notice, that no other than a moist and hot Temperament of the Air brings the *Plague* it self; and that the Duration of this Constitution is the Measure of the Violence of the Pestilence. *Lucretius* is of the same Mind, for in his admirable Description of the *Plague of Athens*,
P p These

These Diseases, says he, either come from the Air, or arise from the Earth.

----- Ubi Putrorem humida nacta est
Intempestivis Pluviisq; & Solibus ista.

In short, the general Histories of Epidemic Distempers do almost constantly confirm thus much, and would have done it more, if the vain Notion of *Occult Venoms* had not prepossess'd the Minds of Authors, and made them regardless of the manifest Causes.

And this is notorious enough in those Countries where Malignant Diseases are most rife. Thus it is a very common Observation in the *East-Indies*, that during the dry Heats the Season is healthful; but when the Rains fall immediately upon the hot Weather, then untoward Fevers begin to threaten.

The same is observ'd in *Africa*; for (as *Joan. Leo* relates) if Showers fall there during the sultry Heats of *July* and *August*, the *Plague* and pestilential Fevers ensue thereupon, with which whosoever is infected hardly escapes.

And here I might, by reflecting on the Use and Necessity of *Respiration*, and the particular Manner of performing it, (of which I have hinted something already) and considering withal the true Nature of Fevers, easily shew how such a Constitution of the Air, as this is, must necessarily produce such Effects; might run over the Propositions of *Bellini*; which as they do plainly evince Malignant and Pestilential Fevers to be owing to a viscid and tenacious Lentor or Slime, which at first obstructs the capillary Arteries, and afterwards being dissolved by Heat, ferments with the Blood, and changes it into a Mass unequally fluid and glutinous, and therefore unfit for all the Operations of the animal Oeconomy; so it would be no uneasy Task to prove, that Air at the same Time hot and moist, being less able to comminute and break the arterial Fluid in the Lungs than is necessary, in order to prepare it for Secretions, it is no Wonder, if when the Blood passing through the capillary Vessels arrives at the secretory Organs, the Cohesion of its Parts not being sufficiently removed, instead of deriving se-

veral Juices out of it into the Glands, it leaves its most glutinous and viscid Parts sticking about the Orifices of these Vessels; which tho' they may at first be wash'd away by the repeated Impulses of the succeeding Blood, yet the Cause continuing, and these Strokes growing still weaker and weaker, (from a lesser Quantity of Spirits being separated, and hence a more languid Contraction of the Heart) these Obstructions are increased to that Degree as not to be removed, till by the violent Agitation of a greater Heat, this slimy Mucus is thrown into the Blood again, and there, in the Nature of a Ferment, so disturbs its Mixture, and changes its Compages, as to make it a Fluid of quite different Properties, that is, altogether unfit for the same Functions or Offices.

This Effect will be the more certain, because a damp Air upon the Surface of the Body checks insensible Perspiration, so that a great Quantity of this being detained, the Obstructions are still greater in the small Tubes; whereas indeed, upon the Account of a more than ordinary Heat, this Discharge ought now to be in an increased Proportion.

Such a Disposition of the Blood as this the Ancients call'd *Putrid*; and, to speak plainly, it is a beginning Stagnation, with a succeeding Heat and Fermentation.

Nor would it be amiss here to take Notice, how unjustly some Authors, having quitted the Consideration of plain Causes, for *Occult Venoms* and *Deleterium quid*, have brought in the *Θείον τι* (something Divine) of *Hippocrates* to favour their fond Hypothesis; tho' his best Interpreter, *Galen*, understood by this Expression no such Thing as they mean; but on the other Hand, only the manifest Constitution of the ambient Air, such as himself has described in his Aphorisms, and which is exactly the same with that we have been discoursing of.

And therefore not only does *Minadours* rightly remark, that in his whole Epidemics, *Hippocrates* never once mentions any *Venom* or *Poison* as the Cause of Malignant Diseases; but the Divine Old Man himself in another Treatise expressly teaches us, that All Maladies do equally, or one as much as another, proceed from the Gods, there being nothing more

Divine in this than in that, each acknowledging its own Natural and manifest Cause.

But I willingly wave insisting upon these Heads, as well as the Hints which might be taken from this Theory, of some Use perhaps in the Cure of these Distempers; and leave it to our Physicians to judge upon how good Grounds they do, in Cases of this Nature, under the Notion of *Alexipharmics*, give such Medicines as raise a great Heat both in the Stomach and Blood; only praying them to take Care, lest while they are engaging the Animal Spirits in War with *Malignities*, they do send treacherous *Auxiliaries* to the supposed weak *Party*; that is, that they either raise new Tumults and Disorders, of worse Consequence than the original Mischief; or at least, by clogging the Wheels, and throwing Dust upon the Springs, of the finest Machine in the Creation, do check and interrupt the Action of Nature, when 'tis employ'd about the most nice and critical Work.

Neither can I, tho' an Occasion be fairly offer'd, by any Means be induced to intermeddle in the Controversy of those Gentlemen, who, by the Help of Two Words, are made Masters both of Philosophy and Physick; I mean, the violent Assertors of *Acid* and *Alkali*. These scanty Principles fall infinitely short of that vast Variety there is in the Works of Nature; however, for their Sakes who are as yet advanc'd no farther, I will advise the contending Parties, (because little Good is got by Quarrelling) to think of an Union, and if they can find no Remedies but out of these two Tribes, to make Use of such as Result from a prudent Mixture of some out of each. If this *Project* does not take, to resolve however on both Sides, to distinguish the differing Times of the same Disease, and know, that as, on the one Hand, *Acid* Medicines are oftentimes as certainly hurtful in the latter End, as they do Service in the Beginning of the Fever; so, on the other, those which are *Alcalious* must necessarily, for the same Reason, do Mischief in the first Periods, for which they are profitable in the last Days of the Distemper.

By what Mechanism this comes to pass, they will easily understand, when they have learn'd what Alteration such Things as these

are do make in the humane Body; nor will it then be a difficult Matter to convince them, that he is equally a fond Slave to an *Hypothesis*, who because *Acids* are sometimes of great Service in Fevers, concludes that their Origine is *Alcalious*; as he who, knowing that stagnating and fermenting Juices do easily turn to *Acidity*, from thence argues that *Alcalies* are the only Cure of this Stagnation and Ferment.

But Dr. *Pitcarne* has abundantly demonstrated the Weakness of these Men's Reasonings, and the Vanity of such immechanical Theories.

And here I would put a Period to this Part of the Discourse, were it not that these Distempers being sometimes *Contagious*, and *Contagion* being justly reputed a real *Poison*, it may be worth the while to examine a little what this is, and wherein it consists; more especially, because some may perhaps be apt to think this to be an Argument of an *Occult Venom*'s being the First and Original Cause.

We are therefore to take Notice, that when a *Fever* is communicated by Way of *Infection* from one already diseased, this most commonly happens in the latter End of the Distemper, that is, (as we before discoursed concerning the *Hydrophobia*) when the fermenting Blood is throwing off great Quantities of its active fermentative Particles upon the Glands of the most constant and easy Secretion; such are those in the Surface of the Body, and the Mouth and Stomach: By this Means therefore the Liquid of insensible Perspiration, and the Sweat, is impregnated with these *Midgown*, and thus the ambient Air becomes fill'd with them; so that not only (as *Bellini* argues) may some of these *Effluvia* insinuate themselves into the Blood of a sound Person thro' the Pores of the outward Skin, but also in Inspiration through the Membrane of the Lungs; for he has in another Place demonstrated how the Air, or something from it, may this Way come to be mix'd with the arterial Fluid; and thus the like *Ferment* will be raised here, as was in the originally distempered Subject.

This may be one, but there is perhaps another yet more dangerous Manner of *Infection*, and that is, by the Breath of the

Diseased taken in by a By-stander, especially in the last Moments, seizing the *Stomach*, and fixing a *Malignity* there. For it is upon this Score, that those who are infected do presently complain of an extreme Pain and *Nausea* in the upper Orifice of the *Stomach*; and that all Authors do agree in the admirable Use of *Vomitus* timely given in this Case; these by their stimulating Force removing the very *Minera* of the Disease; and likewise that, oftentimes in *Pestilential* Illnesses, the *Stomach*, when open'd, has been found gangren'd and mortified. This made *Van Helmont*, who had observed this Part, in one kill'd by a *Plague Infection*, perforated and eroded in several Places, no otherwife than he had seen in one poison'd by *Arsenick*, conclude, that the *Plague* for the most Part begins in the *Stomach* from a coagulated *Tartar* there.

Herein lies the Difference of *Contagion*, from the first Invasion of malignant Distempers; the Effects of the one are the Cause and Beginning of the other; and therefore it is no Wonder, if tho' the Symptoms in the former are by a gradual Increase wrought up to their Height, they do however in the latter, even at the very first, discover their ill Nature and Violence, and, like a reinforced Enemy, by surer Strokes make quicker Dispatch. And this also is the Reason of the great Increase of *Funerals* in *Plague*-time, in that one Death is thus added to another.

If it be difficult to explain the particular Manner how the *Stomach* comes to be thus affected, we must not therefore deny Matter of Fact; and may however probably conjecture, that the last *Breath* of one dying of a malignant Distemper proves thus pernicious, in that those fermenting active Particles, which, as we just now observed, the Blood discharges upon the Glands of the *Mouth*, *Stomach*, *Lungs*, &c. impregnating the Air in its Passage through these; when the same happens to be immediately inspired by a sound Person, it may easily taint the *Salivary* Juices in the *Mouth*, which are very glutinous, and of a fermenting Nature, and therefore susceptible enough of *Contagious Effluvia*, but especially of such as proceed from the same Liquor infected in the Sick Party. Now the *Spiritle* is continually swal-

lowed down into the *Stomack*, and so will quickly impress its *Labes*, or ill Quality, on so tender and sensible a Part; that is, will lodge these corrosive *Salts* (for such we may suppose the Particles of Infection) in the secretory Ducts; whereupon the Glands being obstructed, little *Tumors* are by the Afflux of their Fluid rais'd here and there, which breaking become small *Ulcers*, and produce that dismal Train of Symptoms which we have already related.

And here it may not be amiss to take Notice, that all Authors do agree, one great Cause of *Pestilential* Distempers, especially in Armies and Camps, to be dead Bodies lying exposed and rotting in the open Air; the Reason of which is plain from what we have been advancing; for Battels being generally fought in the Summer-time, it is no Wonder, if the Heat acting upon the unburied *Carcasses*, and fermenting the Juices, draws forth those active Particles, which in great Quantities filling the Atmosphere, when they are inspired and let into the *Stomach*, do affect it after the Manner already described.

To illustrate this Matter, I shall relate a remarkable Story told me by the learned Dr. *Baynard*. The Body of a Malefactor was hung up in Chains in the Country; after a few Months, in very hot Weather, it was Sport and Pastime to some Boys playing thereabouts, to swing the Carcass up and down; one more bold than the rest struck it with his Fist upon the naked Belly, which being outwardly parch'd and dry, and from the falling down of the Humours swell'd and tense, was easily burst by the Blow; out gush'd a Water so corrosive and fiery, that running down the poor Lad's Arm, it caused a violent *Excoriation*, and a very hard Matter it was to preserve it from being truly mortified. What this *Serum* could do upon the outward Skin, the more volatile Parts of it would, without all Doubt, effect upon the more tender and sensible Membranes of the *Stomach*, if a considerable Number of them were fixed there; the Fluids of humane Bodies being ranker, and more abounding in active Salts, than those of other Creatures, which are not continually repaired and nourish'd by the Juices of Animals.

The Way by which *bad Food, ill ripen'd Fruits* of the Earth, &c. do oftentimes produce *Malignant* and *Pestilential* Diseases, is not very different from that by which we have observ'd unwholesom Airs to be the Cause of the like Effects. For the Juices with which those do supply the Blood being corrupted, must necessarily make a Fluid of quite other Properties than what the animal Oeconomy requires, that is, neither fit for Nutrition, nor for the Secretion of those Liquors which in the several Organs are to be derived from it; whereupon the small *Tubes* are obstructed by an unequally glutinous *Slime*; and it is therefore no Wonder, if, besides the other Symptoms ensuing, *sores Pustules, Inflammations, Ulcers, &c.* (more common in Fevers from this Cause than in any other) are rais'd in the Surface of the Body.

This is the Ground of the common Observation, that a *Famine* is very often succeeded by a *Pestilence*. And this *Calamity* generally begins amongst the poorer Sort of People, whose Diet to be sure is the worst.

The City of *Surat* in the *East-Indies* is seldom or never free from the Plague; and yet it is observ'd, that the *English* who trade there are in no Danger of being infected thereby. Now the Chief of the Natives in this Place are *Baniāns*, who neither eat Flesh, nor drink Wine, but live very poorly upon *Herbs, Rice, Water, &c.* and most of the Inhabitants do the like, except Foreigners. This poor Fare, together with the Heat of the Climate, makes them so liable to malignant Distempers; from the Attacks of which, those who feed well are more safe and secure.

Thus much concerning *Poisonous Exhalations and Airs*, so far as the Consideration of the *Grotta de Cani* has led us on to enquire into their Effects; for tho' there may be other Alterations of this same Element, differing in their Nature from this we have insisted upon, and yet equally pernicious and hurtful, yet we take no Notice of any of them, in regard that those which are from *Arsenical, Mercurial*, and the like *Fumes*, are reducible to a foregoing *Essay*; and those which are owing to a Change of the known

Properties of the Air, may be easily explain'd by what has been already delivered in this. I shall therefore rather chuse to make some Remarks on the Mischief of another *Fluid*, which as it is the next in Use to this we have been treating of, so the bad Qualities of it, when it comes to be altered, must necessarily be almost equally fatal and dangerous.

I mean *Water*, which is of so constant Service, not only for our Drinks, but also in preparing of our Flesh and Bread, that it may justly be said to be the *Vehicle* of all our Nourishment; so that whenever this happens to put on other Properties than are necessary to fit it for this Purpose, it is no Wonder if, in its Passage through the Body, these do make suitable Impressions there.

Thus at *Paris*, where the Water of the River *Seine* is so full of stony Corpuscles, that even the Pipes through which it is carried, in Time are incrust'd and stop't up by 'em, the Inhabitants are more subject to the *Stone* in the Bladder than in most other Cities. The same I observ'd in the *Baths of Abano*, a few Miles from *Padua*, to that Degree, that it is necessary very frequently to clear the Wheel of a Mill driven by the Current of these Springs, from the great Quantity of *petrified* Matter with which it is from Time to Time incumbered.

In like Manner, let the gross Particles with which the *Water* is saturated be of any other Nature, *Metallick Salts, &c.* these, according to their various Gravity, the Capacity of Canals, and such like Circumstances, will, when they come to circulate in the animal Body, be by the Laws of Motion deposited in one Part or other. So those Mineral Bodies, and Nitrous Salts, which abound in the Snowy Waters of the *Alps*, do so certainly stuff and enlarge the Glands of the Throat in those who drink 'em, that scarce any who live there are exempted from this Inconvenience.

For this Reason, the Choice of *Water* for Drink among the Ancients was by Weight, the lightest being prefer'd, as most free from all heterogeneous Bodies.

The Cause therefore of *Poisonous Springs* is, their having corrosive Corpuscles mixt with their Water, which cannot fail, when forsaken in the Canals of the Body of their Vehicle,

hicle, to do the same Mischief as they would if taken by themselves undiluted; only with this Difference, that they may in this Form be carried sometimes farther into the the animal Oeconomy, and so having pass'd the *Prima Via*, discover their Malignity in some of the inmost Recesses. Thus the *Fons Ruber* in *Aethiopia*, mentioned by *Pliny*, about which Abundance of native *Minium* or *Cinnabar* was found, shew'd its ill Effects chiefly on the Brain; and therefore *Ovid* says of it,

----- *Si quis Fancibus haust*
Aut Furit aut patitur mirum gravitate Sopor-
tem.

We shall not need then to enlarge on this Matter, since any of the foremention'd *Mineral Poisons* may thus impart their deadly Quality to Waters; and accordingly there are Instances of *Arsenical*, *Mercurial*, &c. Fountains, of which the Histories may be seen in the Collections of the learned *Baccius*, and one very remarkable in the *Philosophical Transactions*.

But as we before took Notice concerning *Airs*, so it may be worth the while to observe of *Waters*; that there are some Alterations of them, which tho' not properly *Poisonous*, yet are of so great Consequence in their Effects, that they may very well deserve to be regarded.

This I shall do with Respect to a great Abuse committed in this Kind about the City; and that is, in the chusing of stagnating impure *Well-Water* for the *Brewing of Beer*, and making other Drinks. Such a Fluid indeed has oftentimes a greater Force and Aptness to extract the Tincture out of *Malt*, than is to be had in the more innocent and soft Liquor of Rivers; but for this very Reason it ought not, unless upon meer Necessity, to be made Use of; this Quality being owing to the *Mineral Particles* and *Aluminous Salts* with which it is impregnated.

A late Author, by searching into the first Accounts of the Distemper we call the *Scurvy*, describ'd by *Pliny* and *Strabo* under the promiscuous Names of *Stomacace* and *Scloiybe*, and examining the authentick Histories of it in later Years, made by the most

observing Physicians in those Countries where it was unhappily revived, as *Olaus Magnus*, *Baldwinus Ronsens*, *J. Wierus*, *Solomon Albertus*, &c. finds, that the Origine of it was in all Times and Places charged upon the Use of unwholesom stagnating Waters. Then by comparing together the *Clayie Strata* of the Earth about the Cities of *London*, *Paris*, and *Amsterdam*, he shews, that where the Water is worst, there this Malady is most rife. So that he has put it out of all Doubt, that most of the perplex'd and complicated Symptoms which are ranged under this one general Name, if they do not entirely owe their Birth to the Malignity of this Element, do however acknowledge it to be their main and principal Cause.

And indeed *Hippocrates* himself, as he has very plainly decipher'd this Disease by the Title of *Σπληνὲς μέσολοι*, or *Great Milt*; so he does very particularly in another Treatise take Notice, that Drinking of Stagnating *Well-Waters* must necessarily induce an ill Disposition both of the *Milt* and *Belly*.

If we enquire into the Reason of such ill Effects, we must consider, that *Clay* is a *Mineral Glebe*, and that the gross Particles and Metallick Salts with which Waters passing through such a Bottom do abound, are, as *Dr. Lister* observes, not to be mastered, that is, indigestible in the humane Body. Not only therefore will these cause, as he very well argues, calculous Concretions in the *Kidneys*, *Bladder*, and *Joints*, and, as *Hippocrates* experienced, hard Swellings in the *Spleen*; but they must necessarily oftentimes, by their corrosive Quality, twitch and irritate the sensible Membranes of the *Stomach* and *Bowels*, and thus hinder and interrupt the Digestion of our Food. Nay, besides all this, when they come into the Blood, it is no Wonder if the small Canals of insensible Perspiration are frequently stopp'd and obstructed by 'em; for it is upon this Score that *Sanctorius* teaches us, that heavy Water converts the Matter of Transpiration into an Ichor, which being retained, induces a Cachexy.

What Mischiefs will insue hereupon every one sees, not only Pains in the Limbs, livid Spots in the Surface of the Body, Ulcers, &c. from the Acrimony of the undischarged Moisture; but many besides those

those perplexing Symptoms which go by the Name of *Hysterical* and *Hypochondriacal*, may take their Rise from the same Source ; for the before cited *Sanctorius* has remark'd, that the *Flatus* or Wind is inseparable from those Cases, is no other than the *Fluid of Perspiration* rude and unfinished.

If these Inconveniencies are oftentimes not felt, at least not till towards the declining Age, in strong and active Habits of Body ; yet I am from very good Experience assured, that they deserve Consideration in weaker Constitutions, and a sedentary Life, especially of the more tender Sex.

I have the Honour to be nearly related to a worthy Person, who led formerly an afflicted Life from the frequent Returns of violent *Colick Pains*, till she was with happy Success advised by the noble *Van Helmont* not to drink (as she then did) Beer brewed with *Well-Water* ; and her Health is even now so far owing to this Management, that

an Error in it is unavoidably followed with the wonted Complaints.

For these Reasons *Pliny* tells us, that *those Waters are condemned in the first Place, which when boiled do incrustate the Sides of the Vessels* : And that our *Well-Waters* do this, no Body who looks into the *Tea-Kettles* of our Gentlewomen can be ignorant.

And indeed in ancient Times, when Physick was more a Science, which is now more a Trade, as that Part of it which relates to Diet was more carefully studied than it is now-a-days ; so this Point particularly of which we are treating was of so great Moment, that *Hippocrates*, who wrote the best Book on the Subject that ever was publish'd, has in a great Measure accounted not only for the Diseases, but even for the Temper and Disposition, of the People of several Countries, from the Difference of the *Waters* with which Nature has supplied them.

Sea Diseases : Or, A Treatise of their Nature, Causes, and Cure. Also an Essay on Bleeding in Fevers, shewing the Quantities of Blood to be let in any of their Periods. By W. Cockburn, M. D. late Physician of His Majesty's Fleet, Fellow of the R. S. and of the College of Physicians, London : The Second Edition, printed in 1706.

THE Doctor says, that finding the Book as acceptable to Strangers far removed from the Sea, as it was to the Seafaring People ; he has in this Edition endeavoured to make it agreeable to the Theoretical Reader ashore. It was translated into *Low-Dutch* by the learned Professor *Bidloo*, and the States ordered every Surgeon belonging to their Ships to get one of 'em ; which alone is enough to recommend its Usefulness.

The Doctor first enquires how the Way of living at Sea, especially the Narrow-Seas, where these Observations were made, may dispose Seafaring People to Diseases,

and what Diseases they are most subject to on that Account : Next he hints at the Difference between them and those in hotter Countries, relates the History of some Years, and lays down proper Indications for Cure.

The Victuals allowed them in Men of War for their daily Food, are, Pork and Pease on *Sundays* and *Thursdays* ; on *Mondays*, Oatmeal (*Burgoo*), Butter and Cheese ; On *Tuesdays* and *Saturdays*, Beef and Pudding, or all Beef ; on *Wednesdays* and *Fridays*, Butter and Cheese, or Oatmeal and Pease, and with these a large Proportion of Bread. The Victuals themselves are as good
of

of the Kind, as any where to be found, and the Allowance greater than may satisfy any ordinary Eater. Their Drink is good Table Beer, in what Quantity they please. Only it were to be wish'd that they might have more proper Victualling in the Time of their Recovery from Sickneſs, when this Kind of Food is really hurtful, and cauſes Two thirds of the Scurvies that abound among Seamen.

Salt Victuals are known by Experience to be the hardeſt to digeſt, and by Conſequence the moſt unfit for a quick or plentiful Supply of thoſe Parts that are to repair the Decays of the Body. Beſides, an Indigeſtion of Pork, which is of great Nouriſhment, produces worſe Effects than Meats that nourish leſs, as is manifeſt by Statical Phyſick; therefore groſs Aliment, and the Quantity of undigeſted Food, do powerfully diſpoſe them to Diſtempers which are completed in ſome Form or Appearances of our ordinary Diſeaſes, according as various Circumſtances concur in their Production. Yet, after all, the Bodies of ſuch working People not only make the beſt of this ſolid Food, and continue long in perfect Health, but it alſo ſeems neceſſary; for thoſe who uſe little or no Exercise, are ſcarce able to reduce ſuch ſolid and parch'd Food into Chyle after 12 or 15 Hours; and when that is done, this Chyle being groſs, and with great Difficulty performing its firſt Voyage through the Lactéal Veſſels, affords but a groſs Supply to the Blood, and therefore muſt diſpoſe ſuch People to Dropſies, Jaundice, and other Cachectical Diſeaſes, which are only to be prevented by keeping the Sailors cloſe to their Work, becauſe Labour helps their Digeſtion, whereas thoſe who are lazy, or incapable of Working about the Ship, as preſſ'd Landmen, &c. are generally over-run with the Scurvy.

This Diſeaſe appears firſt with red Spots in their Arms and Legs, eſpecially where they afterwards turn black or blue, attended with an extraordinary Weakneſs in the Patients, and a Redneſs, Itching and Rottenneſs, of the Gums; Looſeneſs of Teeth, and an unequal Pulſe, ſometimes very high, at other Times very low.

The Victuals above mentioned affects the Sailors when they are not able to move, and

have a weak Digeſtion; for Indigeſtion in the firſt Concoction yields a very groſs Chyle, which is not eaſily converted into Blood, and by this Means Tranſpiration and moſt other Secretions muſt be diminished, which augments the Quantity of Blood, and that Increate muſt be in Proportion to the Impediment of Tranſpiration, and Inequality of the other Secretions. A Quantity of Blood more than what is natural, endued with a proportionable Quantity of Motion, muſt ſtrike harder upon the reſiſting Sides of the Arteries, and the more that they are infected, and this Force by which it falls on theſe Sides may be greater than their Power of Cohæſion, and therefore Blood breaking thro' its Canals, will run out in a Quantity that bears a Proportion to its impelling Force, the Greatneſs of the Wound that is made, and the Reſiſtance of the Place into which it falls; ſo that if the Place be ſuperficial, if any ſufficient Quantity is diſcharged, and the Quality of the Blood ſo groſs that the perſpired Matter is not ſufficient to keep it fluxil by its Quantity and Force, in that Caſe the extravalaſated Blood will corrupt after the ſame Manner, and in that very Order, we find it does when out of the Body, Regard always being had to the Quantity diſcharged, and the Place where it is lodg'd; that is, the Blood thus excluded being in a State of Reſt, does corrupt, and in the different Tranſitions, in the Time of this Corruption, is black, blue, &c. as we ſee in the preſent Caſe, and others of the like Nature: Only it is longer in corrupting, becauſe of its little Quantity, the Fluxility of the perſpiring Steams, and the Warmth of the Place, as might be demonſtrated at great Length. Theſe mechanical Hints, ſays the Doctor, do fairly deliver us from the Neceſſity ſome Men are brought under of acknowledging an abſorbing Power, when they account for the Vanishing of thoſe Spots at a Time they are not converted into Matter or Pus. It has been obſerved, ſay they, that Glands have ſometimes been found obſtructed and filled with a Liquor, the like whereof has been found lying in great Abundance in the neighbouring Parts; and from this they conclude, that this Liquor has been ſuck'd up out of theſe adjacent Parts into the

the Glands. I wish, says the Doctor, they could have discovered by what Machine, Pump, or such like Instrument, lodg'd in those Glands, this Liquor has been drawn up. Certainly it had been more agreeable to the secreting Power, with which we know the Glands are endued, to have concluded that this Liquor, collected in that Abundance, was to be discharged out of those Glands; since this their Power is manifest, and the other unknown.

'Tis known that every Change of Posture is by the Contraction of the Muscles, and as these are more or less vigorously perform'd, we measure our Strength. The Power and Force of these Muscles are in a triplicate Proportion to the Quantity of Blood in its natural Condition; but the Blood in this Case being viscid, we are only to estimate our Strength by the Quantity of Spirits that can be secreted from it, and therefore the Animal indued with such Blood in a greater Quantity, is but in the Condition as if it had one half less.

Moreover since the Heart is a Muscle, 'tis the more weakly contracted, because of a less Quantity of Spirits deriv'd into it; and since 'tis evident, that the Motion of the Blood is as the Force by which the Heart is contracted, and the Contraction of the Heart being weaker, so is the Motion of the Blood; and this Motion being less and less, the further the Blood proceeds in Arteries from the Heart, 'tis the easier stopp'd in its Motion; and because of this obstructing Power, and the Power by which 'tis propell'd, the resisting Arteries are broke thro'; therefore it is in these extreme Parts, where there are likewise great Numbers of the weakest Arteries, that these Eruptions of Blood are, and these black and blue Spots are found.

After the same Manner comes the Inequality of the Pulse, for that being made by a greater Quantity of Blood propell'd out of a wider Part of an Artery into a smaller or narrower, at every Time the Heart is contracted, the Pulse is stronger or weaker, according to the Quantities of Blood and Times of Contraction.

This ill State of the Blood, which occasioned Spots and Eruptions in the extreme Parts, does in a lower Degree of the

same Operation produce Humours of different Sorts, as the Nature of the obstructed Parts will bear; for this thicker Blood being driven through larger Capillaries, in Places not so far from the Heart, its Force in them will be greater than in the capillary Vessels at the Extremities, and consequently those Vessels will not be so easily obstructed as in the Extremities: Yet since this thick Blood does not all of it pass the Vessels at the same Time 'tis impell'd into them, as commonly it does when the Blood is in an ordinary State; the Quantity of Blood contained in these Canals is greater than ordinary, and this greater Quantity of Blood stretches its Vessels by lengthening their Diameter, which also does enlarge the Dimensions of the Part to whose Composition those Blood Vessels go; and this Swelling is more or less conspicuous, as are other Circumstances join'd with it. Moreover as this universal Indispotion of the Blood does affect universally, while it moves through Canals equally disposed; so these Tumors only differ as to the Condition of the Parts that are obstructed; and therefore as the Gums do consist of a Number of nine of the smallest Vessels, and they invest Bones, so their Obstruction must more especially produce Tumors that have the same Colour the Blood has, or Tumors with Inflammation, or the Gums are swell'd and red.

And as these obstructed Parts are pure Blood, so that common Consequents of such an Obstruction will be a Gangrene, viz. a total one, and Ulcers more or less malignant, with better and worse Pus, according to the Goodness of the Blood, and Warmth of the Parts where 'tis generated; so that the Ulcers being foul and stinking, the Pus is likewise naught.

Yet before this total Obstruction, the Parts of the Blood being transpired, tho' not perhaps in their natural Quantity, nor in the ordinary Time; but these transpired Parts coming from gross Blood, are not well comminuted, nor so fine as naturally they ought to be; nay, perhaps they consist of very solid and salt Parts. Now because of this Grossness and Solidity of Particles, they rub more upon the Sides of Vessels, and the small Canals, through which they are perspired; and by this their Friction excite the

Sense of Itching. The Desire of Easing us of this Kind is sometimes of good Use, and contributes very much to prevent this Obstruction, by which Pus is to be generated; for by rubbing the Parts that itch, some of the tender Vessels of the Gums are broke, and the Blood that gushes out, not only leaves more Room for the rest of the Blood in the same Canals, but may contribute very much to the better Circulation of other Blood impelled into these Vessels long after.

By viscid Blood, tho' in a greater Quantity, the Teeth are not so firmly retain'd in their Sockets, as when the Blood is in a State of due Fluidity; and far less is it so in Discharges of Blood from inflamed Gums; and still less when the Gums are wasted by sharp Pus discharged in a great Quantity: But being by this Compression of the Teeth on every Side that they have their Stability, and they being less forcibly compress'd, as is said, they must become less firm, and be loose.

The Doctor having thus given us an Account of the Symptoms of the Scurvy, and how Seamen come to be affected with it, he comes next to consider their Bread, of which every Man is allowed a Pound per Day. Moderate eating of Bread has always been allowed to contribute much to the preserving of Health, but a Surfeit of Bread is the worst of all others: The Substance of it being tough and tenacious, 'tis not so easily broken and divided by the Stomach; and if eaten in greater Quantity than sufficient to give a Body to the Chyle, 'tis apt to occasion Obstructions, and thick gross Humours; as an entire Abstinence from Bread deprives the Chyle of that Body which is necessary to make its Passage slow enough through the Guts, and occasions Gripings, Loosenesses, and such other Distempers as attend them. Having premised thus much, he considers the Effects that Sea-Bisket may have upon the Mariners.

1. A Pound of Bread so dry and solid as that must be for keeping, if brought to the Consistence of common Bread, would be near twice as big as it is, and this he thinks too much for Men generally to eat. Besides, when ground by the Teeth, and sent to the

Stomach, 'tis very hard to be digested, if not very fine; and if fine, it so imbibes the small Quantity of Chyle that is made of the other Victuals, that the Mass of Blood receives a very small Quantity of it, and that Mass which passes the Guts where the Lacteal Vessels are inserted, is so harden'd and compacted, that it occasions Costiveness, which is of very ill Consequence, especially at Sea, produces many other Maladies, and always obstructs the Cure of Fevers; for when our Intestines are stuffed with a great many Days Victuals, they are so distended, and the Blood Vessels in them so press'd or straiten'd, that the Circulation through them is very much interrupted, and not only the Blood which used to flow that Way, but even that of the neighbouring Parts, is forced from its Channels, and equally filling the Channels of the rest of the Parts of the Body, that have less Resistance in some Degree, press the Origine of the Nerves in the Brain, and Blood Vessels of the Eyes, and so produce that Stupor and Thicknes of Sight People frequently feel in that Case. Besides, the Chyle must needs be very much interrupted, and kept from being convey'd in a sufficient Quantity for recruiting the Mass of Blood, by the Pressure of the Lacteal Vessels which are interwoven with the Guts; for the Chyle is forced along the whole Length of the Guts with the grosser Mass, and so the Body is not only deprived of its necessary Nourishment, but there is an eminent Hazard of Obstructions in the Lacteal Vessels, which very often produce those dangerous *Ascites's* that are seldom cured.

The Doctor, in the next Place, shews some other more common Consequences of Men's catching Cold: First, he says, 'tis known, that the Quantity of the Blood is not always augmented equally, in Proportion to the Suppression or Interruption of Perspiration; and therefore the Matter thus detained, in an interrupted Transpiration, is discharged by other Parts of Evacuation, and is the Cause, as well as the Matter, of these extraordinary Discharges. But supposing that any Part of it is secreted in a greater Quantity by the Glands of the Intestines, Stomach, or *Pancreas*; the Liquor thus secreted will

will make every Thing more liquid in the Stomach and Intestines. Besides, if it is endued with sharp Parts, it may stimulate the Guts also; and both by the Liquidness of the Excrements, and by augmenting the peristaltical Motion of the Intestines, those Excrements are protruded out by the *Anus* with great Force; *i. e.* the Matter of insensible Perspiration being thus thrown upon the Guts, will occasion a *Diarrhœa*: For that is nothing else than a more frequent going to Stool, with Slime, Gall or other Humours, because of an extraordinary Contraction of the Guts, an Increase of Excrements, their greater Liquidity; of most (if not all) of 'em together.

He observes, That this Distemper is not so frequent in the Channel and other Parts, where he made these Observations, and therefore does not insist much upon it, but refers for a further Account of it to a Book called, *Alv. pro Fluv.*

Having thus made it manifest, that there are two very different Affections of the Blood arising from catching of Cold; he says, there's a third which happens from no assignable Circumstances, though 'tis not essentially different from the first Case mentioned. The Blood and other Humours contract such a Lentor or Thickness as has been already observed, yet after passing through the various Periods above related, it does not acquire a due Temperament and Composition, or Health does not ensue, as in the former Case; but the Disease returns, and describes more such Periods to an indefinite Time, and that either by a fresh Supply of new Matter that is able to produce this Affection entirely, or by the Means only of the former Lentor not being thoroughly dissolved: Yet in the Intervals of the forming these new Periods, Men seem to be in perfect Health, till suddenly attack'd by this new Paroxysm of an Ague, which the Doctor describes as follows:

1. They feel a Coldness after Dinner, their Lips are pale, they tremble, their Pulse is weak, they lie insensible, while sometimes their external Senses are sound, and sometimes faulty, while their Minds are clear, their Body stiff like a Corps, and they have a great Drought; yet instead of Death,

which one would expect by those Appearances, come Warmth and Heats, which continue some Time, and end in Sweating. At this Time the Pulse is strong, and more frequent; they have a Beating in their Head, a great Drought, and after Sweating, they are well to Appearance. It returns every Day, every third, fourth, &c. Day inclusive. They recover thoroughly; but sometimes it ends in Death, and that in the Return.

He afterwards accounts for these Symptoms as follows:

1. Coldness after Dinner. He says, the Thickness of the Blood confining its hot and small Parts, is the true and genuine Cause of that Coldness; and this Thickness of the Blood he supposes to be occasioned by the Viscidity of the Chyle join'd to the viscid Blood; for in an Hour and half after Eating, the Lacteals are found to be full of this Chyle.

2. The Paleness of the Lips is occasioned also by the Thickness of the Blood, which cannot flow in any Quantity through the Capillary Vessels.

3. Their Trembling proceeds from the Thickness and Weakness of the Blood, which is thereby made incapable of supplying a natural Quantity of Spirits to be protruded into the Nerves. Now the Motion of the Spirits being alternate, and their continual Efflux proceeding only from their Abundance in the Nerves, and at present the Quantity of Spirits generated being very little, their Efflux is not so constant, or not perfectly continual, and consequently the Muscles into which they are derived are not so constantly contracted. Their *Æquilibrum* is unequally preserved, sometimes one Muscle, sometimes another, being interchangeably contracted; and this interchangeable Contraction of antagonistical Muscles being that which Physicians call Trembling, 'tis plain that by this Defect of Animal Spirits, Trembling must ensue.

4. The Weakness of their Pulse proceeds from the Muscle of the Heart's being more weakly contracted, because of the Defect of Animal Spirits to drive the Blood out of the Heart with Force through all the Canals.

5. Their lying insensible proceeds from the Difficulty the Arteries are under to be restored after their Dilatation, so that the Nerves are compress'd, and by this their Compression the Animal Spirits are derived in a small Quantity, and the Patient is in a Kind of Sleep or Stupor, which may be, while such Distentions of Arteries affect little in other Parts: Therefore the Patients may lie insensible, while their external Senses are sound. On the other Hand, any one, or all the external Senses, may be defective, while the Mind is clear. This will happen, if we suppose a Quantity of this thick Blood subsisting about any Artery or *Plexus* of Arteries which involve, or are contiguous to, any Nerve that serves for Hearing, Seeing, Tasting, &c. For when these Arteries are stuffed up and filled by the continual Afflux of new Blood, their Sides tend outwards, and are more distended, and these contiguous Nerves are more compress'd, till at length it hinders the Motion of Animal Spirits in those Canals; and by this Means it happens, that a Man may be thick of Hearing, or perfectly deaf, blind, lose his Taste, &c. yet he may recover them suddenly, the Coldness being over after the Lentor is protruded into the Veins.

6. That their Body becomes like a Corps is occasioned thus: During the Lentor, Spirits are not only generated in a small Quantity, and the Sides of Arteries more distended than ordinarily, but likewise the thick Blood is next to stagnating in all its Vessels; yet in the Time of this defective Quantity of Spirits, they are equally protruded into the Nerves, and consequently the Muscles are equally contracted; but by this equal Contraction, the Muscles and their Antagonists remain in *Equilibrio*, and by Consequence without Motion, or not easily brought into it.

7. Their Drought he accounts for thus: The Thickness of the Blood diminishes Secretions of all Sorts, and among others that of Spittle, so that there is a Want of the Afflux of necessary Moisture in those Parts, which occasions Drought.

8. The Return of Warmth and Heat, instead of Death, is occasioned thus: The Heart, having no antagonistical Muscle, is contracted, while all others are at Rest, or

kept in *Equilibrio* by their equal Contractions; but because the Motion of the Heart is continued, and the Endeavour of the hot Parts to extricate themselves from this Viscidity, Heat and Fluidity will be at last obtained, according to the different Powers of the Viscidity and hot Parts, as was shewn before. Now if this Motion thus continued is able to dissolve and comminute this gross and stagnating Blood, the Body that appeared dead and a Corps, will become warm, and hotter for some Time than before.

9. The Pulse becomes stronger and more frequent from the same Cause; for the Spirits being thus derived into the Heart with a greater *Impetus*, its Contraction is stronger, and the Blood is impelled into the Arteries very quickly.

10. The Beating in their Forehead comes from the same Cause; for in this frequent and great Distention of the Arteries that run on the hairy Scalp, and in that Part of it about the Ear, upon which we chance to lie, the tending out of their Sides, and their beating on the Pillow, produce this Noise we are sensible of.

11. Their great Drought happens thus: The Blood not being propell'd to such a Degree as to produce a sufficient Quantity of Secretions, the Tongue becomes dry: Besides, the Motion of the Blood being quicker, and the Heat greater, the Spittle, which is separated in a greater Quantity, is soon evaporated from off the Tongue, and from this Dryness of the Tongue arises a Thirst, which is greater and more intolerable because of the Heat.

12. He accounts for its ending in a Sweat thus: The Lentor of the Blood being dissolved, and its Velocity increased till the Viscidity is destroy'd, Secretions are produced; and the greatest and most sensible is by the Pores, which lessens the Velocity and Heat of the Blood, with the other Adjuncts of a Fever.

13. That the Patient then appears to be well, happens by the removing of the above-mentioned Symptoms.

14. The Returns of the Paroxysms are accounted for thus: Tho' the Paroxysm is determined by the mentioned Way, yet if the Viscidity that produced the first is not consumed, but returns in a certain Time; or if

it is consumed, and purged off by some of the known Ways of Excretion, or so comminuted that 'tis changed into the Nature of pure Blood; yet the Cause which produc'd the first Lentor will in a certain Time produce the like again, and cause the same Symptoms. There being then two Ways by which the Returns of a Fit may be made, let us suppose that there are two Returns every Day, and at the same Hour, (the same Reasoning will hold good for others that return in the same or any assign'd Difference of Time) and the first is produced by a Lentor that lasts for one Day, and thereafter is either purged out of the Body, or changed into pure Blood, and the second by a Lentor of the same Quantity and Quality with that which made the first; then any of those Lentors, or any other that can invade at the same Hour, and take up a whole Day before 'tis consumed, may successively and by Degrees be collected in the Blood Vessels; so that it either flows thither insensibly, but constantly, in the smallest Particles, or it may be bred within the same, till it can produce a Sense of Cold, and other Symptoms that attend it. Now before this Cold and its Attendants can seize us, it is necessary that this Lentor subsists in the Capillary Arteries, which cannot be, unless its Quantity is such that it does not mix with the Blood, and flow with it freely through the Arteries. Therefore either this great Quantity of Lentor is bred at once in the Blood Vessels, which is possible, or else 'tis derived into them at once from other Parts, which is not inconceivable; but 'tis very evident how this very Quantity may flow into these Vessels by Degrees, or be bred gradually in the same. Wherefore 'tis manifest that in one Day's Space, either this Lentor, or something that breeds it, may get into the Vessels, and in so small a Quantity, that it takes up a whole Day before a sufficient Quantity is collected to produce the Coldness and its Attendants; so that at the End of a Day the Coldness will begin again, and make a new Return. The same is true of other Returns, not made by the same Lentor coming again, but by a new one, the former being quite consumed. This Consumption may be sooner or later in the same Day, according to the different Nature of

the Lentor, the Bodies that are mix'd with it, and their Dissolution in the Increase and Declination of the Disease.

The Doctor comes next to give an Account of the Seamen's Oatmeal Victuals, which they call Burgoo. He says, 'tis very fit to correct that Thickness of the Humors and Costiveness which are the unavoidable Consequences of their ordinary Diet and Idleness; for Oats being of a thin Substance, and that of all the Grains used for Victuals from which the greatest Quantity of Oil may be drawn, they not only preserve the Motion requisite to make a due Perspiration, by adding Spirits to the Blood, but keep it in a convenient Degree of Liquidity, and by their cleansing Power keep the Belly open. In short, the Doctor thinks Burgoo so wholesome for Seamen, that since they generally like it least of all their other Victuals, because, as they pretend, they are not allow'd Butter enough, he wishes they had more Sauce to render it more grateful. He says the same of Pease, and that they are of a more temperate Nature, and esteem'd by *Galen* and other Physicians a *Medium* between Things of good and bad Nourishment.

Then he gives an Account of their Lodging. He says, that what by their pilfering of Hammocks one from another, their lying on or between the Decks when pretty warm after a Can of Flip, and the Press'd Men's real Want of Clothes, they contract a Cold, which is the Cause of most of their Miseries; tho' he observes, that an untimely Use of Sweating Medicines in some, and thickning Lozenges in others, is more frequently the Cause of Fevers, Phthisicks, &c. and more fatal than a Cold, if left to the Strength of the Blood and Abstinence, without employing any other Auxiliaries. He says, that the Force of Perspiration is only kept up by a certain *Impetus* and Degree of the Blood's Velocity, and that is only interrupted by the Falling or Diminution of this. It would be easy to give a more conceivable Account of catching Cold, than is generally assign'd to be done by the Nitrosity of the Air.

The Doctor informs us afterwards, that it is agreed on by all Physicians, that Perspiration, when we catch Cold, is not free, as

in a natural State, but interrupted, and a great deal of that Substance which is usually separated that Way is detain'd in the Mass of Blood: What is so detain'd proportionably increases its Bulk, and fills the Vessels, which becomes the Source of all those Symptoms that are observed to attend a Cold.

These Symptoms are, 1. A Heaviness, a great Feebleness over all the Body, sudden Weakness, a Coldness in all the Extremities except the Brain, a Pain in the Bones, and a weak Ear and depress'd Pulse; and sometimes these Symptoms are attended with Sleepiness. In a Day or two the Pulse is great and strong, they become warm, restless and thirsty. Their Tongue is dry, black and rough; their Breathing difficult, and their Breath hot like Fire. They are delirious, and cannot sleep, and their Sickness ends by Sweating, an Hamorrhage, Looseness, &c. or in Death.

He says, these are the Symptoms that appear most constantly in Fevers in our narrow Seas, and in this very Order. He comes next to shew how these Symptoms may proceed from an Interruption in Transpiration: First, he says, it is evident that a greater Quantity of Blood does make a Weight proportionably great to the augmented Quantity. But then naturally, as the Quantity of Blood is, so is the Strength of our Bodies, or its Power to resist this greater Weight; and in that Case the added Weight is insensible, otherwise than in the press'd Supposition. But, Secondly, we become sensible of an extraordinary Weight, when, besides our own Body, we carry some other along with us; and after the same Manner we begin to find our own Body heavy, when it either becomes heavier, or retaining the same Weight, there happens a Defect either in preparing, secreting or deriving, Animal Spirits; for then, *ex Hypothese*, there is the same, or a greater Weight to be supported by a less Force; and because of this Inequality of the Weight and Force of our Body, it falls heavier, or we are sensible of a more than ordinary Weight. That this may happen so by a Quantity of Blood which is more than natural, is very manifest; for let it be supposed that the Blood has no other Defect besides its greater Quantity, yet

because of this its Quantity, the Canals of the Blood are more distended than ordinary, and by the like Distention of the Arteries in the Brim, its whole Composition is proportionably compress'd, and by Consequence the Cavities of the tender Nerves much straiten'd, by which the Spirits are hardly derived into these Canals. Now the Strength of the Muscles being, *ceteris paribus*, as the Quantity of Spirits and their Motion, and the Quantity of Spirits and Motion being less by the Difficulty of their being deriv'd into the Nerves, so is the Force of the Muscles likewise, and they too being weaker, and the Weight of our Body greater on the same, we become sensible of its Weight. Moreover it is known the Quantity of Blood cannot be increas'd above a limited Quantity, except its Cohesion be likewise greater, or that some Degree of Lensor is induc'd into the Blood. Now because of this Lensor the Motion of the Blood and other Liquors is much impeded, and a smaller Quantity of Spirits secreted, and therefore the Weight of the Body is greater, and its Strength less, and we more sensible of its Weight. Besides 'tis known that our daily Heaviness is on some such Account, for by the natural Lensor of all Blood and Secretions, the Velocity of the Blood lessens to a certain Degree; and without any Regard to the Secretions, the Velocity of our Spirits lessens ~~to a certain~~ Part in a Second; and therefore an equal Respect being had to the Lensor supposed in the present Case, this Lensor and Quantity may be increas'd to any Quantity, and so may this extraordinary Weight.

The great Feebleness proceeds from the Quantity of Blood thus augmented and tainted, as well as from the Spirits being separated in a less Quantity, and derived by less Force. For this Weakness being opposed to the ordinary Vigour with which we move, and our Body's carried from one Place to another, which being only performed by the more powerful Actions of our Muscles, and proceeding too from the Quantity of liquid Blood, and that of the Spirits, these Quantities being less than natural, as well as less powerfully impelled, the Force of the Muscles, and the Vigour and Agility that attended, must be proportionably less, and we become feeble.

This Feebleness is sudden, contrary to that proceeding from the Want of Blood, which is commonly the Work of Time; and tho' perhaps the Cause does not operate suddenly, yet the Feebleness it self is perceived to be very great, and that felt only suddenly; for if 6, 8 or 10 Pound were necessary to compleat that Fulness which is required to produce this and the other mentioned Symptoms, 'tis certain such a Quantity may be readily obtained in a little Time, and consequently its Effects must be sudden. This is evident from what *Sanctorius* has observed, for let the Quantity of what we eat and drink in one Day not only be 8 Pound, but somewhat less, viz. 7, 6 and 5, the Quantity of Stools in the largest Estimate does not exceed half a Pound, and the Quantity of our Water two Pound, the Remainder is wasted insensibly, that an Equality of Weight may be preserved in an Animal, which Equality is kept up unequally. But in this Interruption of Secretions, if we are supposed to retain the Half of six Pound in one Day, then it is evident that this augmented Quantity is had in little more Time than three Days, and consequently the Weakness is produced in so small a Time. If the requisite Quantity was supposed to be made by two or three Ounces at a Time, and that Quantity was equally retain'd, and not wasted, then it is certain the Production should not be so quick and sudden, tho' this Effect of Weakness may still be so, because we don't become sensible of the Effect, till it is in that Quantity sufficient to produce the Weakness this Way; and therefore we become sensible of the Weakness, only after the whole Quantity is accumulated, and that being by the last added Quantity, the three Ounces, or some Part of it, 'tis by the Quantity added in some Part of the last Day of Health we are sensible of its Effect, and feel our selves weak: So that this Weakness seems to be the Production of one Day, or very sudden. It is easy in both the mentioned Cases to make a Computation of the detained Steams in different Suppositions, and it is not impossible to determine actually within a very little the real Performances of Secretions in Animals respectively, or of the same Animal at different Times.

The Heat of the Body is proportionable to the Quantity of hot Parts in the Blood, or to its Velocity, *ceteris paribus*; and the Quantity of these Parts are commonly as the Quantity of Blood: Now the Quantity of Blood being greater, the hot Parts affect the sensible Parts less with their Heat, even as if they were in a smaller Quantity. 'Tis certain that this less Affection of Heat does proceed only from these hot Parts being confin'd, so that they cannot act, and there being a Lensor in the Blood at this Time, it is this Lensor that thus confines them, or it is the Lensor that occasions this universal Coldness, by locking up the hot Parts of the Blood.

But in any State or Condition of the Blood whatever, the Fluidity of the Blood is greatest as it goes out of the Heart into the *Aorta*; and is likewise the grossest as it returns by the *Cava* into the Heart: And thus its Fluidity decreasing orderly, as it removes from the Heart, in the remoter Arteries, the Lensor increases there in the like Manner, and the Velocity is less in Proportion as is the Sum of the Diameters of the Ramifications of Arteries to their Trunks. Thus in those extreme Parts the Heat becomes less.

On the other Hand, the Blood convey'd into the Brain being carried in Vessels that have fewer Ramifications than like Vessels of the same Length, and these Ramifications running out to no great Length in the Brain before they discharge their Liquor into wide and numerous *Sinus's*, 'tis for these Reasons that the Velocity of the Blood with Lensor is more preserved in its Circulation through the Brain than in other Places of the same Distance from the Heart, and the Heat of the Blood being proportionable to its Velocity, it is greater in the Brain than in any other remote Part.

The Blood being thus augmented in Quantity and Viscidity, it must fill in a suitable Manner these Arteries thro' which it flows, and the Coats of these Arteries being much stretch'd, have their compounding Parts more disjoin'd from one another, which Disjoining is a Solution of Unity or Pain: Though from this hinted Cause of Pain it is manifest, that the Bones can never occasion a feeling of Pain; yet it is as evident, that the

the *Periostrum* which so closely invests them is capable of producing any Sort of Pain, and because of this their Contiguity, and the Thinness of this Membrane, the Affections of the one cannot be distinguish'd from the other, if both could be affected in the same Manner. This is the Cause, when the *Periostrum* is affected with any Sort of Pain, we complain of a Pain in the Bones, that are better and more universally known to those that feel Pain than the *Periostrum* it self.

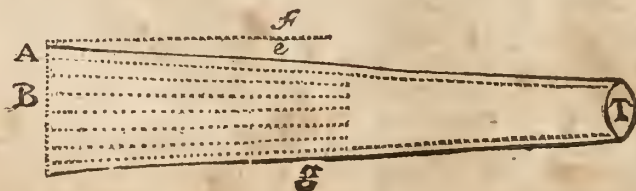
From hence the Blood is less capable to separate its fine and subtile Parts, and there being a less Quantity of them, the Contraction of the Muscles is so much the weaker, and the Blood will be squeez'd out of the Heart with the less Velocity, which causes the Arteries to be more slowly distended, so that the Pulsation is weaker than it ought to be.

The same is the Reason why the Beating of the Pulse becomes rare, for the Motion of the Heart and Arteries are Synchronical, and from the same Causes proceeds what we call a depress'd Pulse.

The Doctor says, the Pulse is made by a greater Quantity of Blood impell'd from the wider Part of an Artery into its next narrower Station, and that every Time the Heart is contracted, and in the Time of its Dilatation, the Blood thus impell'd by the preceding Systole, has its Motion continued by the restitutive Power of the Artery; viz. the elastical Force of its membranous Coats, and the Contraction of the muscular one. These Powers are so great, that they are able to bring the inner Surfaces of these Vessels to be contiguous when Blood is not impell'd for some Time, and would always do it but for the circulating Blood; and therefore when at any Time there is a greater Quantity of Blood, and that more hardly propell'd because of its Lentor, the

Arteries being fuller, are more hardly restor'd.

The Doctor says, he must be fuller in explaining this, because a Physician who attack'd the Doctrine of *Harvey's* Circulation, pretended likewise to find an Impossibility in this Way of explaining Pulses; but his Mistake proceeded from his understanding neither of these Doctrines. Our Author, to illustrate what he has said, (tho' he cannot here sufficiently clear it, but reserves it to its own Place) supposes *A T* to be an Artery in its natural Position, fill'd with Blood flowing from *B*, *Ae* one Side, and *Ag* the other; and the prick'd Line *Af*, the Side *Ae*, when fill'd at every Contraction, and distended to *f*, where the Finger is supposed to be. After the same Manner, *Ag* tending outward as freely as *Ae*, then *Ag*, opposite to *Ae*, will make an *Excursus* equal to *Ae*; but when *Ag* runs over a Bone, as in Places where the Pulse is easiest felt, or near it, so that it cannot so freely be distended by the impell'd Blood, in that Case the Distention of *Ag* will be added to the Distention of *Ae*, or thereabouts, and the Distention of *Ae* will be double of what it otherwise would be. This is manifest, and is evidently the Cause of Pulses, and their being so sensible. But it has been said, that in Time of the Diastole the Side *Ae* returns from *f* to its natural Posture, and that by the mentioned Powers. Now whether *Af*, or 2 *Af*, don't return to *Ae* because of the Resistance and Lentor of the Blood, but only half Way, viz. from 2 *Af* to *Af*; in that Case, *Af* coming out against our Finger cannot strike our Finger so strong, the *Transcurfus* in the same Time being but half the Length, and therefore the Pulse is depress'd, as we have said; but if the Return is very little, viz. $\frac{1}{4}$ or $\frac{1}{6}$ of *Af*, then the Distention at next Contraction of the Heart is very inconsiderable.

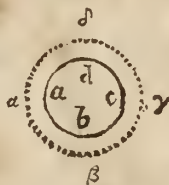


But this last Consideration will more particularly appear, if we suppose *ABC* the



transverse Section of an Artery when it is in its natural Position, but by a *Plethora* become larger; the Artery being distended, the Section fills the Place *a b c*. If the Breadth of the Ring be but $\frac{1}{200}$ of the Diameter of the Artery, there will be very near as much Blood contain'd within the Ring, as there can be in the whole Circle *ABC*. Now the Diameters of these Arteries, where we commonly feel the Pulse beat, are not above $\frac{1}{20}$ of an Inch, and consequently the Breadth of the Ring will not be above the two hundredth Part of an Inch, which is so small a Quantity as cannot be easily perceived by Sight or Touch.

Suppose now the Circle *a b c d* to be the Section of the Artery thus distended, and



because the Heart consists of very strong Muscles, the Capacity of the Heart cannot be much increas'd, and therefore at every Pulsation there will not be a much greater Quantity of Blood discharged into the Arteries than before the *Plethora*. 'Tis known, that the Coat *a b c d* will be further extended at every Pulsation about one hundredth Part of an Inch, viz. to *a b c d*, so as to receive a Quantity of Blood equal to what the Artery receives when 'tis in its natural State; or, which is the same Thing, the Breadth of that Ring between the two Circles *a b c d*, and *a b c d*, which is equal to the above Circle *ABC*, will not be found to exceed the hundredth Part of an Inch. Supposing then that, in an ordinary State of Health, all the Blood at every Pulsation

were forced out at the Artery, and that the Coats came together, yet in this State of a *Plethora* the Artery will not rise against your Finger above the hundredth Part of an Inch, which is indiscernible.

This Squeezing of Blood through the Canal is imagin'd to proceed from the straitning of its Cavity, and by something that compresses it, and therefore this Pulse is said to be compress'd, but this is impossible, tho' the Feeling is just, and the Quantity of Blood is too great for the Cavity of the Vessel, especially to produce a natural Pulse; nay there may be no Pulse, or no sensible one, according to the Fulness.

The Arteries are thus distended by a Quantity of Blood and Lentor, and the Pulse depress'd; but their Distention being proportionably greater, as the Resistance the Sides of these Arteries meet with in their tending outward is less, it is manifest that their greatest Freedom to be distended is in the Brain, because of its Softness, which is compress'd in that Manner, and to that Degree almost, that the Blood Vessels are distended; and because of its being thus compress'd, the Secretion and Derivation of Animal Spirits is impeded by the Compression, which is still not so lasting, because of the Restitution. Yet because of this Affection we are sleepy, and therefore in the Time of this Quantity and Lentor there is Sleepiness, as is manifest from the Cause and Effects of Sleep.

These Symptoms, says the Doctor, may in general be continued as long as this Lentor it self, and that according to its Quantity and Degrees of Cohesion, it being in Consideration of them that it is more easily or hardly dissolv'd. He adds, that since he found by Experience, while he was at Sea, that these Symptoms began to go off in a Day or two, or that the Heat did sensibly return in that Time; he concludes, that the Nature of this Lentor might be dissolved in some Measure in that Space, and that this is done by the Bloods becoming warm, and being delivered from its confining viscid Parts, which is soonest felt nearest the Heart.

The Heat thus proceeding, the Blood becomes more fluid, and the Pulse great and strong, and hence proceeds Restlessness and Drought, the Roughness and Blackness of

the Tongue, the Difficulty of Breathing, the Heat of the Breath, *Deliriums*, and Want of Sleep.

He comes next to the going off of this Sickness; and first tells us, that this Distemper proceeding from a greater Quantity of Blood, goes only off by the Discharge of that Quantity.

Therefore it is no Wonder that sensible Evacuations are produced in the End of this Disease, or put an End to it: But if the Lentor, in the first Case, be not dissolved, and remains the same, the Quantity of Blood may be increas'd till all the Vessels of the whole Body be fill'd with as much Liquor as if they had been forcibly injected with a Syringe, in which Case the Blood cannot move. But, 2. This Lentor will increase, and hinder the Animal Spirits to be separated and derived, and by these the Contraction of the Heart and Motion of the Blood destroy'd, so as the Patient dies. 3. If some Secretions continue the same, or are increas'd, and the Lentor not dissolved, the Quantity of Fluid Blood will be lessen'd so much, that from the remaining thick Blood there cannot be a sufficient Separation of Spirits to propel the Blood, the Consequence of which must be Death. On the other Hand, the Quantity of Blood thus augmented may be increas'd by the Dissolution in such a Manner, that the Arteries of the Brain being too long kept in a Stretch, the Beginnings of the Nerves are so compress'd by them, that no Spirits can be impell'd, neither any derived, or not in a sufficient Quantity for the Contraction of the Heart, which will be follow'd by Death.

The Doctor having thus demonstrated the Necessity of these Symptoms from a supposed Interruption in Transpiration, he proceeds to vindicate this Theory from being merely an Hypothesis, and says, That if we take one or more of the mentioned Symptoms, and read them backward, according to the known and familiar Rules of Nature, without having Regard to any Hypothesis, we shall find them proceeding from such a Fulness as has been insisted on; and if that is true, the Supposition so far was properly made, and every Thing true we have deduc'd from it. In Confirmation of this, he takes the first Symptom that offers it self to

his Explication, and finds it entirely owing to this Fulness of Blood. Our growing suddenly weak, says he, makes it manifest, that it proceeds from this Fulness of Blood exclusive of every Thing else. How it may be occasioned by that, is evident from what has been already said; and besides this Way, says he, there is not another, but by a real Want of Blood and Spirits, through some natural Evacuation augmented, or a preternatural one made. But neither of these happen while we have a Fever form'd, and therefore the assign'd one is the Cause. He refers to *Sanctorius's* Statical Medicine for the Proof of this; where it appears, that the Discharge by Transpiration is not only greater than any one of the rest, but that it is double to all of them; nay, that in some People it is 15 Times greater than their Evacuation by Stool; therefore, when it is interrupted, it is capable of producing that Fulness in half the Time that all the other Secretions together can do it.

The Doctor says, 'tis no Contradiction nor Impossibility for this Lentor to be collected by Degrees, and to lie in the Blood till 'tis sufficient to make a Paroxysm, tho' it must circulate through the Body several hundred Times before a Paroxysm can be produc'd: Therefore 'tis more apt to be wasted in the great Quantity of Transpiration and other Secretions, than to lie so long as to make any Disease.

He owns it to be true, that 'tis hard to apprehend how so small a Quantity of Matter as this is supposed to be, should be mix'd with 20 Pound of Blood, and either not assimilated to its Nature, or cast out with its Parts, that are plentifully then discharged in sundry Places. But so long as we know it to be Matter of Fact that happens in many other Cases, it is possible in this, which is all he alledges. He instances for Proof of it, Asparagus, Onions, Cassia, Rhubarb, Turpentine, &c. whose Smell, Colour, and other of their sensible Qualities, we know are preserved in the Blood more Days than one, by their being discharged in that Time in Urine, Milk, &c. for this is a certain Argument that there's something of these Bodies carried into the Breasts and Kidneys, without losing of its Nature, tho' it has been often carried through the Lungs and all the Body;

Body; and it may be very probable, that this viscid Stuff may be very often carried round the Body without any considerable Alteration. The Biting of a Mad Dog is a most extraordinary Example, which shews how the whole Mass of Blood may be tainted and corrupted by an insensible Quantity of Liquors, which produce no manifest Effect till after many thousand Circulations, for the Space of 30 or 40 Days; so that before its appearing, it has circulated some thousand Times through the Lungs without suffering any Diminution of its Strength; nay, in that Time has altered the whole Mass of Blood, and changed it into its Nature.

He derives the Original of this Lentor from an Interruption of Transpiration, tho' it may possibly be supplied from every Thing that yields us Nourishment, Passions, &c. But let it be generated in the Blood without any Substance added to it, as it may be by Passions, &c. or let it be supposed that some strange Matter was brought into it by the Chyle from the *Viscera*, &c. all or any of them able to form this Lentor; 'tis certain, its Condition being such, these Paroxysms, with their orderly or disorderly Returns, will follow.

He comes in the last Place to give an Account how it sometimes ends in Death at the Return of a Fit. He says, if there be so great a Quantity of Lentor mix'd with the Blood that it can't be driven out of the small Arteries into the Veins; or tho' the Quantity be less, yet if its Adhesion to the Vessels be stronger than can be broken off from the Sides of those Vessels, or cannot be driven along in them, in that Case the Blood must stop, and in a little Time the Body will be cold, there will be no Blood derived into the Muscles, it either arrives not to the Brain, or totally stagnates there, which is Death. But all this happening at the Invasion of the Coldness, and that because the Lentor which occasions it cannot be dissolv'd, 'tis evident that at this Time, or in the Return, they always die.

He says, it is likewise evident from what has been said, that a thorough Recovery, either naturally happening, or brought about by Medicines, is by a thorough Dissolution of this Lentor, the correcting the *Viscera* that supply it, and a total Exclusion

of it out of the Blood; and by this no Returns happen as formerly.

He adds, that the different Appearances of those Diseases are various, according to the Seamen's moderate or immoderate Use of strong Liquors, and that the temperate Use of Liquors more spirituous than Small Beer, seems sometimes necessary to give the requisite Force to protrude their gross Chyle, and to convert it into Blood proper for Circulation in every Part of the Body, and that this is a ready Way to preserve them from the Dropsy, Jaundice, and Hypochondriac Melancholy. But he observes, that by their ill Husbandry and Intemperance they are frequently so drunk, that they are not able to crawl into their Hammocks, but sleep upon the cold Deck, and contract those Sicknesses occasioned by Want of Perspiration; only their Blood being full of the Spirits of the Liquor, they don't lie so long under the Coldness that begins all Fevers as in those which proceed from other Causes.

He comes next to consider the Difference between these Diseases thus related, and these or others that happen in hotter Countries. He says, that the Lodging, Victualing, and Way of Living, being the same in both Places, these different Effects are altogether owing to the Air in which they live, as it may concur with other Causes in producing these Diseases. There's a great Difference betwixt hot and cold Air, in Heat and Weight by discovering how Air of such Qualities concur with the other Causes he found the Progress of their Diseases with and without Medicines, as is said; and he is convinc'd this Matter admits of such a Certainty, as Surgeons of an indifferent Education might be capable to practise in those Fevers in the *E. and W. Indies*, with as great Success as Physicians in *England* and other temperate Countries.

Here he gives us an Account why he has neglected the common Stories of Poison, the Chymical Principles, and of Acid and Alkali.

1. As to Poison, which some assert to be in the Spirits, and produces these Fevers, he says, it is not explain'd by its Patrons, and is very unintelligible, nor have they prescrib'd any Counter-poison for a Cure. He adds, there can be nothing found in the most

malignant Fevers that can really distinguish them from any other continued Fevers, and that all the Difference which can be alledg'd, may be naturally accounted for by a greater or lesser Quantity of this Lentor, its greater or lesser Cohesion, and its different Solution. But what he says is most surprising to him is, that in a Family of 10 or 12 People, those of the best Blood, and strongest Habit of Body, do soonest catch it, and run the greatest Risk. He says, 'tis evident that malignant Fevers proceed from the same Lentor that causes others from this; that most of those malignant Fevers succeed Quotidians and Tertians, in which there are greater Quantities of Heat and Humidity that dissolve this Lentor, tho' they come not so frequently after Quartans, in which the Viscidity is greater, and the warm Parts more confin'd.

2. As to the Chymical Principles, they are so far from being simple, and having the requisite Properties of Simples, as one of the most learned Chymists has demonstrated, that 'tis strange any should advise us to assume Propositions so unknown, in order to the explaining of Sciences that have so useful and necessary a Practice. The Chymists, he says, tell us, that a Fever is nothing but too great a Quantity of Sulphur in the Blood, or that too much exalted. He inquires into its Power of doing this, and producing that Effect. In order to make this Enquiry with more Exactness, he supposes with all Philosophers, that if any Thing can be alledg'd as a Cause, and the Effect always follows, without the Help of any Thing else, we may undoubtedly assert that to be the productive Cause of this Effect; and on the contrary, if the pretended Cause be there, and the Effect follows next, or if that which is said to be the Effect be present without the Cause, then that Cause never produces that Effect. Therefore since adding of sulphureous Medicines to the Blood, will not only heighten the Power of the Sulphur in the Blood, but produce more, 'tis plain that upon this Addition we must always have a Fever: Yet, after drinking salt and sulphureous Bath Waters, which are mix'd with the Blood, and dispers'd all over the Body, we find no such Feverish Fits. He adds, that in the Suppression of Urine by the Stone,

the sharp and pungent ammonical Salts of the Urine should infect the Mass of the Blood, and produce those feverish Effects, which nevertheless are seldom observ'd to happen, and may then be more properly produc'd by other Causes. Besides, we know that when a Dram or two of Oil of Sulphur is immediately poured into the Blood of a live Dog by his Blood Vessels, and the Vessel bound up, the Dog, tho' he makes some little Moan, yet, as soon as 'tis set at Liberty, is free from any Fever, skips about full of Health, and eats whatever Food comes in his Way. Therefore the Doctor concludes, that an Alteration made in the Blood by salt and sulphureous Juices and Spirits is not the productive Cause of a Fever.

He has omitted Acids and Alkali's, because they who set up for it have not told us what it is, when they tell us that an Acid is that which can ferment with an Alkali; and we know that some Medicines, both simple and compounded, ferment with such as are declared Acids, and then with others that are determined to be Alkali's. For what he says further on this Subject, we refer to the Book it self.

The Second Part of this Treatise consists of Historical Observations of the Sickneses in the Fleet, which he made by himself, or had from others, to which he has added the Way of curing them. The Observations are 30, for which we refer to the Book it self, and come to the Doctor's Essay on Bleeding, which is the last Part of his Treatise, wherein he gives an Account of the Quantities of Blood to be let in Fevers in any of their Periods.

He says, we must consider the various Methods that are taken to help the Practice of Bleeding, and first puts us in Mind, that Bleeding claims the chief Consideration, among other Evacuations that are necessary for the Cure of Fevers: For they being necessary, this is the most compleat and simple Evacuation, by which we have the Quantity we demand with the greatest Certainty, without inducing Parts of unaccountable Operations to be mix'd with the Blood. This Evacuation, says he, best deserves our serious Consideration, notwithstanding the Difficulties which attend it; and they that are
against

against it as too dangerous, should likewise discontinue all other Evacuations and Methods of Practice, since they are press'd with the same and greater Difficulties. The Uncertainty and Danger of Sweating Medicines, of provoking Urine, the doubtful Administration of Purgatives, or even of lenient Purges, and the precarious Use of acid and alkali Medicines, are enough to throw us into such Despair, as rather to leave our Patients to the Strength of Nature, than that they should perish by rash Attempts intended for their Safety.

In the next Place, the Doctor considers the ordinary Rules for Bleeding, which are, 1. That Blood may be let in any Quantity, till the sick Person faints away. 2. Till the Colour of the Blood change from worse to better, from being black till 'tis red. 3. Till we take away enough. 4. To take such a Quantity, that the Strength of the sick Person be not impaired. Lastly, Till the Fullness of the Vessels is depleted.

As to the First, he says, it has very little Regard to Diseases, for we bleed often in Fevers to increase the Velocity of the Blood, which cannot be performed by this Rule. 2. By Revulsion and Derivation, the Velocity of the Blood is more increas'd in one Part than in many others, especially in Time of Bleeding. But these partial Velocities of the Blood may be caus'd without this Rule, nay, could not be if it was observ'd: Therefore this Rule, far from directing us, would hinder many good Effects commonly obtained by Bleeding. Lastly, this Rule is perfectly useless, for some People faint at the first Sight of their Blood, or at the very Launcet, while others can bear the greatest Part to be let out before they faint.

The 2d Rule he owns to be more distinct, yet he says, if we are only to bleed when the Colour of the Blood is degenerated from its Redness, we should omit Bleeding in many Cases wherein Experience has shewn it to be useful. For Instance, Bleeding is a sudden and great Relief in Apoplexies, in Mania's,

in Melancholy, and often in continual Fevers, tho' the Blood in these Diseases is frequently redder than at other Times. Besides, according to this Rule, a Man whose Blood is of a Colour, ought not to be let Blood in case of a Fall, by which Neglect he might fall into Rheumatical and Pleuritical Pains, Fevers, Imposthumes, Apoplexies, &c. The Doctor adds, that if we are only to bleed when the Blood is discolour'd, and till such Time as it acquires its natural Colour, 'tis certain that in most Cases we might drein the Body of all the Blood sooner than compass this Design. For besides what we may observe in the Experience of Bleeding, 'tis not unreasonable to believe, that the Blood does not much differ in Degrees of Illness in every Part of the Body, and then the Rule will be dangerous.

The 3d Rule is so very uncertain, that 'tis a Wonder how it ever came to be thought on; for it wants another Rule to direct us when we have taken enough.

The 4th is more particular, but as difficult to be discovered as any of the rest. But for the better understanding it, he refers to the great *Italian Physician Laurentius Bellini*.

The last Rule is taken from the Largeness of some Mens Vessels more than others, or of this Largeness in a Man at one Time more than at another; and they think that this extraordinary Quantity may be discharged, which is known to be done when the Vessels have acquir'd their former Size. But this Rule labours under all the Difficulties to be met with in the former, besides others that are peculiar to it self; for it is evident, that they who have the largest Blood Vessels have the least Blood, and are the least able to bear its Evacuations. Besides, the Quantity of Blood may be augmented by Bleeding, of which the Doctor gives several Instances. He says, that to know the Times of Bleeding is a Matter of great Importance, and refers to *Bellini*, as the only Physician who has writ tolerably on this Subject.

AN EXPLANATION of the FIGURES.

Of the Vessels of Generation, or Genital Parts, of Men. Taken from Reynerus de Graef, Physician at Delph.

T A B. I.

Fig. I. *Of the Vessels called Preparantia and Deferentia of the Testicles.*

- A.* The Artery preparing the Seed, running out naturally from the Trunk of the Artery towards the Testicle.
- B, B.* A Ramification of the preparing Artery, forwarding the Seed towards the Testicle, very rarely observed by us in this Subject.
- C.* The common Divarication of the Artery preparing the Seed into two Branches.
- D, D.* A lesser Branch of the Artery preparing the Seed which runs to the *Epididymida*.
- E, E.* The larger Branch of the preparing Artery, which is inserted into the upper Part of the Testicle, and by its Back descends towards the lower Part, to which is join'd a lesser Ball of the *Epididymida*, and returns again through the Belly of the Testicle, where it is divided into several Branches.
- F.* A larger Ball of the *Epididymida*, firmly adhering to the upper Part of the Testicle.
- G.* The middle Part of the *Epididymida* inverted, that the Ramifications of the Artery running through the inferior Part thereof may appear.
- H.* The lesser Ball of the *Epididymida*, firmly knit to the inferior Part of the Testicle.
- I.* The End of the *Epididymida*, or the Beginning of the *Vasa Deferentia*.
- K.* The *Vas Deferens*, cut off before it comes to the hinder Part of the Urinary Bladder.
- L.* The Testicle, so placed that its Vessels may the better appear.

Fig. II.

- A.* The preparing Vein, from the descending Trunk of the *Vena Cava*, running to the very Testicle.
- B, B.* Branches of the preparing Vein, tending towards the Caul and *Peritoneum*.
- C.* The first Division of the preparing Vein into two Branches, which are afterwards subdivided in a different Manner, and joined again.
- D, D, D, D.* The Valves of the preparing Veins, about which the Veins, while they are blown up, appear knotty.
- E, E, E, E.* The Divisions of the preparing Veins, and several Unions, whereby the superfluous Blood from the Generation of the Seed contain'd in one Ramification may return to the Heart by another.
- F, F.* The upper Part of the Testicle, by which the Ramifications of the preparing Vein may be implanted in the Back.
- G, G.* The Ramifications of the preparing Veins creeping by the Sides of the Testicles, by the *Tunica abbuginea*.
- H.* The Body of the Testicle.
- I.* The larger Ball of the *Epididymida*, firmly adhering to the upper Part of the Testicle.
- K.* The

The middle Part of the *Epididymide*, slightly sticking to the Testicle.

firmly knit to the inferior Part of the Testicle.

L. The lesser Ball of the *Epididymide*,

M. The *Vas Deferens*, cut almost off in the Middle.

Fig. III.

- A. A Part of the *Vas Deferens*, in which the Cavity is conspicuous.
- B. The serpentine Windings about the End of the *Epididymide*, from the loosen'd Part.
- C. The last Solution of the *Epididymide*.
- D. The serpentine Foldings about the Middle of the *Epididymide* unloosen'd.
- E. The last unfolding of that Part.
- F. Another Part about the Middle of the *Epididymide* from the loosen'd Part.
- G. The last Solution of the same Part, by which Means the whole Body of the *Epi-*

- didymide* appears to be as one continued Vessel, that by Degrees touches the upper Part of the Testicle.
- H. The larger Ball, or the Beginning of the *Epididymide*, so that its Vessel is divided into several Branches.
- I. The Belly of the Testicle.
- K. The preparing Artery, which ascends from the inferior Part of the Testicle, by its Belly.
- L, L. The Ramifications of the preparing Veins.

T A B. II.

Shows the Humane Testicles, with their proper Coverings and Vessels.

Fig. I.

- A. Part of the preparing Vessels cut off.
- B. The *Tunica Vaginalis*, containing in it self all the Vessels of the Testicles.
- C. The Beginning of the *Cremaster* Muscle.
- D. The carnos Fibres of the *Cremaster* Muscle, which are joined to the *Tunica Vaginalis*, and run through it lengthways.
- E. E. The carnos Fibres of the *Cremaster* Muscle, terminating obscurely in the *Tunica Vaginalis*.
- F. The *Tunica Vaginalis* containing the Testicles.

Fig. II.

- A. The preparing Vessels, transversly cut.
- B. The Vessels of the Testicles, freed from the *Tunica Vaginalis*, and by certain fine Membranes, slightly united one among another.
- C, C. The preparing Artery ascending thro' the Belly of the Testicle.
- D, D. The Branchings of the preparing Veins running on the Sides of the Testicles.
- E. The *Tunica abbuginea*, containing on every Side the Substance of the Testicle.
- F. The retracted Part of the *Tunica Vaginalis*.
- G. The larger Globe or Ball of the *Epididymide*.
- H. The middle Part thereof.
- I. The lesser Ball.
- K. The End of the *Epididymide*, or Beginning of the *Vas Deferens*.
- L. The *Vas Deferens* cut off.

Fig. III.

Fig. III.

- A. The preparing Artery, as commonly found in Humane Bodies.
 B. The Division of the preparing Artery into two Branches.
 C, C. The larger Branch of the preparing Artery running to the Testicle.
 D, D. The lesser Branch, making its Way towards the *Epididymidæ*.
 E. The greater Ball of the *Epididymidæ* sticking to the Testicle.
 F, F. The *Epididymis* inverted, from whence it may appear how the Artery runs under it.
 G. The End of the *Epididymis*.
 H. A Part or Portion of the *Vas Deferens*.
-

T A B. III.

Shows the Testicles of Brute Animals, in which the Testicular Vessels may more easily and plainly be seen, as well from Art as Nature.

Fig. I.

- A, A, A. The *Tunica Vaginalis* brought to the Sides.
 B. The preparing Artery, which before came to the *Testes*, roll'd up from the Side breadthways, and back again.
 C. The preparing Vessels knit together by a certain thin Membrane.
 D, D. The preparing Artery rising upwards thro' the Belly of the Testicle.
 E. The Tracings of the preparing Vein.
 F. The Canine Testicle grown turgid with the Seed from the *Epididymis*.
 G. The larger Globe of the *Epididymis*.
 H. The lesser Globe.
 I. The Beginning of the *Vas Deferens*.
 K. The *Vas Deferens* in a Dog tied before Coition.

Fig. II.

- A. The preparing Vessels cut off.
 B. The preparing Vessels in a less confused Order, as express'd in the former Figure from the Engraver.
 C. Branchings of the preparing Vessels, tending to the *Epididymidæ*.
 D, D. A large Branch of the preparing Artery running out thro' the Belly of the Testicle.
 E, E. Ramifications of the preparing Veins.
 F. A Dog's Testicle turgid with Seed.
 G. The great Ball or Globe of the *Epididymis* turgid or swell'd with Seed.
 H. The lesser Ball likewise distended with the Abundance of Seed.
 I. The End of the *Epididymidæ*, or Beginning of the *Vas Deferens*.
 K. The *Vas Deferens*, likewise bound so that the Seminal Vessels may more evidently appear fill'd with Seed.

Fig. III.

Fig. III.

- A, A.* The large Ball of the *Epididymis* inverted, that the Divarications of the Duct of the *Epididymis*, and the Progresses thereof, may appear.
- B.* The superior Part of the Testicle, from whence the seminal Vessels proceed the great Ball of the *Epididymis*.
- C.* The preparing Vessels cut off.
- D, D.* The Divarications of the preparing Vessels.
- E.* The Body of the Dog's Testicle.

Fig. IV.

- A.* The Dog's Testicle cut transversely.
- B, B, B.* The seminal Vessels, as they are plac'd amongst the Membranes in certain Order.
- C.* The Root of the *Epididymis*. From *Highmore*.

Fig. V.

- A.* The Testicle of a Mouse, in which the seminal Vessels so swell with Seed, without any previous Preparation, that they may be clearly and distinctly seen through the Albuginous Membrane.
- B.* The preparing Vessels cut off.
- C.* The preparing Artery.
- D.* Ramifications of the preparing Vein.
- E.* The Proceedings or going out of the seminal Vessels from the Testicle.
- F.* The concave Part of the greater Ball of the *Epididymis*, lying naturally to the Testicle now raised up.
- G.* The lesser Ball, the first Division whereof in this is turned as it were into a Round.
- H.* A Portion of the *Vas Deferens*.
- I.* Ramifications of the *Vasa preparantia*, running to the *Epididymida*.

T A B. IV.

*Shows the Humane Testicles, dissected several Ways, with the Glan-
dulous Body.*

Fig. I.

- A.* The Beginning of the *Epididymis*, or the Place in which the seminal Vessels perforate the *Tunica albuginea* of the Testicle, which the Engraver ought to have express'd in a higher Place.
- B, B, B.* The great Ball of the *Epididymis* protracted, that the various Ramifications thereof may appear, the Manner of going out and coming into the Testicles.
- C.* The *Vasa preparantia* cut off.
- D.* Their Divarications creeping along the *Tunica albuginea*.
- E.* The *Tunica albuginea* of the Testicles, tying the Testicle close on all Sides.

Fig. II.

- A. The Body of the Testicle, stripped naked from the *Tunica albuginea*.
 B, B. The *Tunica albuginea* inverted, and protracted upwards.
 C, C, C. Small Portions of the preparing Vessels cut off, perforating the *Tunica albuginea*.
 D. The *Tunica albuginea*, firmly adhering to the Back of the Testicle, by reason of the Membranes of the Testicle there intermix'd.

Fig. III.

- A. The Substance of the Testicle cleared from the *Tunica Albuginea*.
 B, B, B. The freeing or opening of the Body of the Testicle, whereby it appears that it is not glandulous, as it appears to be at first Sight, but composed of Vessels.
 C. A small Portion of the *Tunica albuginea* stretch'd upwards.

Fig. IV.

- A, A, A, A. The seminal Vessels of the Testicles placed amongst the fine Membranes in due Order.
 B, B. The seminal Vessels running thro' the membranous Substance adhering to the Back of the Testicle.
 C. Small Parts or Portions of the seminal Vessels cut off, that perforate the *Tunica albuginea* before the serpentine Duct, as is seen in Fig. I. B, B, B. constituting the Great Globe of the *Epididymis*.
 D, D, D, D. The *Tunica albuginea* in the fore Part of the Testicle, and brought to the Sides.

Fig. V.

- A. The Testicle transversly dissected.
 B, B, B. The Dispositions of the seminal Vessels.
 C. The seminal Vessels of the Membranes.

Fig. VI.

- A, A. The glandulous Body divided in the fore Part.
 B. The *Urethra* open'd in the upper Part.
 C, C, C. The Ducts of the glandulous Body laid naked.
 O. The Place of the Caruncle, by which the Seed flows from the *Testes* through the *Urethra*.

We have taken no Notice of any Figures of the *Penis* in this Place, because you have 7 Figures of that Part at P. 72. of the Second

Volume, and an Explanation of the same at P. 137. Taken from de Graef, Diemerbroeck, Baulin, Tyson, Cowper, &c.

Tab. I.
Fig. I.
The Penis and Prepuce of the Penis.



Fig. II.
The Penis and Prepuce of the Penis.



Fig. III.
The Penis and Prepuce of the Penis.



Tab. II.

Fig. I.

The Penis and Prepuce of the Penis.



Fig. II.

The Penis and Prepuce of the Penis.



Fig. III.

The Penis and Prepuce of the Penis.



Fig. I.

The Penis and Prepuce of the Penis.



Tab. III.

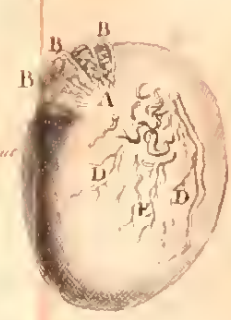
Fig. II.

The Penis and Prepuce of the Penis.



Fig. I.

The Penis and Prepuce of the Penis.



Tab. IV.

Fig. IV.

The Penis and Prepuce of the Penis.



Fig. II.

The Penis and Prepuce of the Penis.



Fig. V.

The Penis and Prepuce of the Penis.



Fig. III.



Fig. IV.



Fig. V.

The Penis and Prepuce of the Penis.



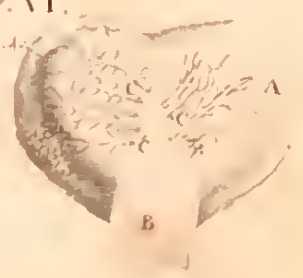
Fig. III.

The Penis and Prepuce of the Penis.

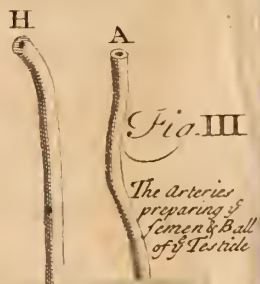
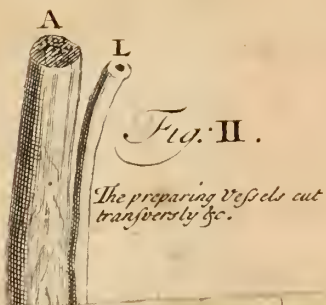


Fig. VI.

The Penis and Prepuce of the Penis.



The Penis and Prepuce of the Penis.



Under the Head of the Genital Parts of Men are included, as principally described by the foregoing and the following Chapter, the Spermatick Vessels, the Testicles, the Paraftataæ, the Vasa Deferentia, the Vesiculæ Seminales, the Proftates, and the Scrotum.

THE *Spermatick Vessels*, otherwise called *Vasa preparantia*, are two *Arteries* and two *Veins*; though in these Vessels Nature does not always observe the same Rule, varying often their Number, Origination, and Insertion; but most commonly they hold that Number.

The *Spermatick Arteries* ordinarily arise from the fore Part of the Trunk of the *Aorta*, about two Inches below the Emulgents.

The Structure of these *Arteries* is very singular; for, contrary to the Course of all other *Arteries*, which are largest at their Exit from the Trunk whence they part, and grow gradually less in their Course, these are less in their Origine from the *Aorta*, than in their Progress towards the *Testes*. By this Stricture at their Orifice, the Blood receives a Check at its first going off from these Parts, whereby its *Impetus* and *Velocity* are abated. The same End is answer'd by a different Mechanism in *Quadrupeds*, whose *Spermatick Arteries* are curl'd and contorted in their Passage like a Screw. For which different Methods of doing the same Thing, Mr. Conper gives a Reason which seems to me beyond Exception just, viz. That if the Humane *Spermatick Arteries* were contorted, as in *Quadrupeds*, the Apertures in the Abdominal Muscles of Men must be much larger than now they are, and would frequently let the Intestines descend into the Scrotum; an Accident which, however, often happens. To such Ruptures (as they are called) *Quadrupeds* are not so liable, though the

Passages for the *Spermatick Vessels* be much wider in them than in Men; because the Position of the Trunks of their Bodies being Horizontal, their Intestines cannot press on the Processes of the Peritonæum, as in Men, whose Posture is Erect.

These *Arteries*, immediately after their meeting with the *Spermatick Veins*, enter together with them the inner Lamella of the *Peritonæum*, which affords them a Coat, wrapp'd up in which they run along the *Psoa* Muscles, till they reach the Processus of the *Peritonæum*, bestowing some Branches in their Passage upon the *Peritonæum*. Here insinuating themselves into the Duplicature of the Processus, and being streightly cloath'd with it, they pass the Foramina of the oblique and transverse Muscles of the Abdomen, and at about three or four Fingers Breadth from the Testicles are divided into two unequal Branches, the bigger of which goes to the Testicle it self, where, after having enter'd the Substance of it, it is split into an Abundance of Ramifications, disposed like the Tendrils of Vines, which are dispers'd all through it. The lesser descends to the *Paraftata* or *Epididymis*, and is there distributed as the other is, in the Testicle.

The Processus of the *Peritonæum* embraces these Vessels very closely, and, together with them, exactly fills up the Perforations of the Muscles, and so prevents the falling through of the Intestines, to which the erect Posture might render them obnoxious if they were wider, as in Dogs, and some other Animals,

they are, whose *Horizontal Posture* does not expose them to that Danger.

The *Spermatick Veins* take the same Course with the *Arteries*, but a little above the *Testicles* they split into several Branches, which unite again several Times, forming thereby that Sort of *Plexus* called, *Corpus Varicosum Pampiniforme*, or *Pyramidale*. The Blood returned by these *Veins* is delivered on the right Side to the *Cava*, a little above the *Exit* of the *Artery* from the *Aorta*, and on the left Side into the *Emulgent Vein*, to avoid crossing the *Great Artery*, in its Passage over which the Blood might be stopp'd by the Pulsation of the subjacent *Artery*, or perhaps the *Vein* it self be broken. In these *Veins* are divers *Valves*, as well in the Parts nearer to the *Testicle*, as at their *Exit* into the *Cava*, and left *Emulgent*.

Along with these Vessels, on each Side, go two Branches of *Nerves*; one, from the *Plexus* of the *Pelvis*, form'd out of the Branches of the *Intercostals*; the other, from the second Pair of the *Vertebra* of the *Loins*; which latter, however, is very often not found.

The *Testicles* are soft white Bodies, usually in Number two, though some have naturally had three, and others but one: Their Figure is Oval, and their Size about the Bigness of a small Pullet's, or large Pigeon's Egg. They have been thought to have been of a *Glandulous Substance*, and, according to the present prevailing Notion of the Structure of *Glands*, they may be allow'd to be so still, notwithstanding the Discovery of that inquisitive *Anatomist Doctor de Graaf*, who finds them to be nothing but a Convolution of Vessels of divers Kinds, whereof the principal are the Blood Vessels before described, of which the *Arteries* bring the Blood from whence the *Seed* is to be separated, and the *Veins* return it after that Separation made: The rest of the *Testicle*, which is much the greater Part, is made up of *Seed Vessels*, which are indeed but one continued Series or Rope intricately convoluted, and wound up as it were into a Bottom, but adhering so laxly, that they are easily drawn out into length, and, in *Rats*, shaken from their close Contexture, by first separating the *Tunica albuginea*, and putting the *Testicle* into Water, and then agi-

tating it lightly, these feminal *Tubuli* will be very manifestly disjoin'd.

Some have fancied *Glands* to be necessarily interspers'd for the Separation of the *Seed*; but no Man has been able yet to demonstrate them, nor does the Necessity appear, if we suppose, as at present many do, that all *Glands* are but a Convolution of the sanguineous and excretory Vessels, though in other Parts their Texture be not so loose, nor their excretory *Tubules* so conspicuous.

These *Seminal Tubuli*, or Vessels, terminate in the *Paraftates* or *Epididymide*, which are *tuberos varicose Bodies*, lying upon, and adhering, to the upper Part of the *Testes*, of which they seem properly a Part, tho' of a different Form and Consistence: For tho' the *Paraftate* be only a various Convolution of the *Seminal Tubuli*, mix'd with the Blood Vessels, as the *Testicles* themselves are; yet here those *Tubuli* being united into one, the various Convolutions of which being more firmly bound together by a strong Membrane arising from the *Tunica albuginea*, the Body of it feels more compact.

The *Testicles* and *Paraftates* are said to be inclos'd in three proper *Membranes*. It is pretended the first is derived from the *Cremaster Muscle*, which we take to be a needless Multiplication of *Membranes*, all *Muscles*, like this, having their proper *Membrane*, which is all that is meant herein. This *Cremaster Muscle* presenting it self, must be removed before the proper *Membrane* of this Part can be seen: It springs fleshy from the Spine of the *Ossium*, and in its Descent expands it self on the Surface of the *Tunica vaginalis*, to which it firmly adheres.

The *Tunica Elytroides*, or *Vaginalis*, is a Continuation of the external *Lamina* of the *Peritonaeum*, and is liable to be divided into several *Membranes*, which some *Anatomists* please themselves with. It incloses the whole *Testicle*. The third Coat is the *Albuginea*, so called from its Colour, which is White. It is a strong thick *Membrane*, very smooth on the outward Surface; the inward, which adheres to the Substance of the *Testicle*, is rough and uneven. Into the upper Part of this *Membrane* are inserted the *Blood Vessels*, *Nerves* and *Lymphatics*, which send from thence divers Branches into the Substance of the *Testicle*.

The

The *Lymphatics*, which do not appear in the common Dissections, shew themselves pretty plentifully upon this *Membrane*, if a Ligature be laid upon the *Corpus Varicosum* of a Dog, or any other Live Subject. They go to the common *Receptacle of Chyle*.

The common *Capsula*, or *Membrane*, wherein the *Testicles* are contain'd, is the *Scrotum*. This consists of two *Membranes*, the exterior being only a Production of the *Cuticula* or *Cutis*, which is here somewhat thinner than in other Parts, without any *Fat* under it. The inner *Membrane*, which is called *Dartos*, is only an Expansion of the *Panniculus Carnosus*, which, together with the *Cutis*, is drawn into the Figure of a Purse externally. This Purse is, as it were, divided by a Line, which runs longitudinally, and parts it into the right and left Side, and is called the Suture. Answering to this inwardly, is a *Membrane* which divides the Cavity just in the same Manner, being only a Production of the *Dartos*, as the *Mediastinum* is of the *Pleura*. It is like that divisible into *Lamella*, and the *Testicles* are on each Side loosely connected to it, by Means of their proper *Tunic*. It serves to sustain the *Testes*, and to defend them from Collision against each other, to prevent their falling down too low, in which it is auxiliary to the *Cremasters*, and to promote the Corruption of the *Scrotum*.

From each *Testicle* proceeds a round hollow Body, resembling somewhat, in external Appearance, a large *Nerve*, which is call'd *Vas Deferens* or *Ejaculans*. It arises from the Extremity of the *Epididymis*, and is nothing else but a Production of the *Seminal Tubulus* or Channel, which is continued from thence to the *Vesicula Seminales*. It is about the Bigness of a small Goose-Quill, and ascending along with the *Vasa Praeparantia*, it makes several Serpentine or Worm-like Turnings and Windings before it leaves the Body of the *Testicle*, where it composes that Body called the *Epididymis*, and thence enters the *Abdomen*, with the aforementioned Vessels, thro' the Perforations of the *transverse* and *oblique* Muscles. Having enter'd the *Abdomen*, it is reflected towards the Back of the *Bladder*, and crossing the *Ureter*, grows larger as it approaches the *Vesicula Seminales*, and then again contracting it self just at the *Vesicula Seminales*, the two *Deferents* come together,

and seem to pass between them into the *Prostates*, and through them into the *Urethra*, without communicating, till then, either with one another, or with the *Vesicula Seminales*, or *Prostates*.

It has been a Controversy among the *Anatomists*, whether the *Vasa Deferentia* had any Communication with the *Vesicula Seminales*, or did deposite into them the Seed, which they convey'd from the *Testicles*. Doctor *Wharton*, *Swammerdam*, *van Horn*, and of late Doctor *Garth*, in his *Lectures* at the College of *Physicians*, have maintain'd the Negative, as others have done the Affirmative, whose Reasons for their Opinions we shall take Notice of by and by.

The *Vesicula Seminales* are two membranous Bladders, situate between the *Vesica Urinaria* about the Neck, and the *Intestinum Rectum*. They are ordinarily three or four Fingers Breadth long, and one broad, and about the third Part of an Inch thick, though their Dimensions vary very much in the same Subject, according as they are full or empty.

They consist of divers membranous Cells, which are plainly to be seen in a *Vesicula Seminalis* blown up and dried, and afterwards cut. These Cells open one into another, as appears by the ready Communication of the *Flatus*. They are not all of a Size, but some are greater, some less, and all are form'd out of the same fibrous Membrane, through the Contraction of which, by the Influx of the Animal Spirits in *Coitu*, some will have the Emission to be occasioned; though I cannot think the *Fibres* sufficient for that Purpose.

These *Vesicula* appear externally variously and unequally contorted and convoluted, resembling the irregular Figure of the *Intestines* of a small Bird, cover'd with a thin Membrane, upon which creep many Branches of *Arteries*, *Veins*, *Nerves* and *Lymphatics*.

From each Side they empty themselves, without communicating with each other, into a small Duct, which, about a Finger's Breadth below the Neck of the *Bladder*, is inserted separately into the hinder Part of the *Urethra*.

Between the Mouths of each of these Ducts is a small *Septum* plac'd, to hinder the Seed coming from one Side from rushing upon, and so stopping the Discharge of the other.

This

This *Septum* is called, *Caput Gallinaginis*, or *Galli Gallinacci*, and on each Side of it, thro' the fore-mentioned Orifices, the *Seed* rushes into the *Urethra*.

But lest the *Seed* should perpetually leak at each Orifice, a *Caruncle*, serving for a *Valve*, is placed, which hinders it from ouzing weakly out, but when it is emitted with Vigour, gives Way, and after the Force is over, recovers the Situation again.

The *Prostates* form a *Spongy glandulous Body*, somewhat flattish on its upper Surface, situate just below the Neck of the *Vesica*, about the Bigness of a Wall-nut. Authors have ascrib'd to it a Substance of two Kinds; one *Glandulous*, and the other *Spongy* or *Porous*, which latter seems in Reality to be nothing else but a *Congeries* of very minute Vessels, and extremely small membranous Cells: In the Middle of those run the *Excretory Ducts* of the *Vesicula*, passing quite through without any Communication. It has excretory Ducts of its own pretty numerous. *De Graaf* does not remember to have observ'd them fewer than ten in Men, and in Dogs he has seen near an hundred. Every one of these discharges it self into the *Urethra*, some above, some below the *Caput Gallinaceum*, but all more laterally than the Orifices of the *Vesicula Seminales*; having each of them its proper *Caruncle*. Out of these issues a Sort of *glutinous transparent Liquor*, which some would have to be a third Sort of *Seed*, but in my Opinion serves only to lubricate the Passage of the *Urethra*, and thereby to prevent any Adhesion of the *True Seed*, which might hinder its being emitted with a sufficient *Impetus*. The *Prostates* are externally cover'd with a fibrous Membrane, somewhat like that of the *Vesicula*, and through it are dispers'd the same Sort of Vessels, and from the same Parts, as *Arteries* and *Veins* from the *Hypogastricks* and *Mesaraicks*, and *Nerves* from the *Plexus* of the *Pelvis*.

Those who with *de Graaf* (which is the greatest Part of Anatomists) hold that the *Vesicula Seminales* are *Receptacles* only of *Seed*, elaborated before in the *Testicles*, and convey'd thither by the *Vasa Deferentia*, are press'd by the Arguments of their Adversaries, who urge, that the *Vasa Deferentia* are continued down to the *Urethra*, without imparting or receiving any Thing by the Way; and this

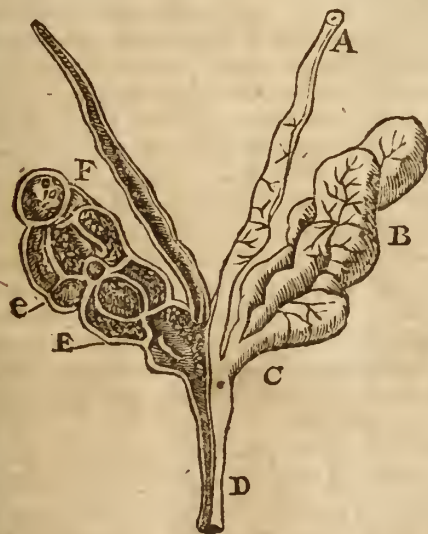
they infer from the *Vasa Deferentia* being brought, as it were, below the *Vesicula Seminales*, and approaching them only at their Extremity, where whatever they contain should rather, as they think, go out than come in. But this is no conclusive Argument, unless they did prove by an absolute mechanical Necessity, that no Fluid in a Humane Body could enter and come out again at different Times, and under a different Force or Pressure, by the same Orifice.

But not to answer one Objection with another, which might easily be done, it is plain that the *Vasa Deferentia* and *Vesicula Seminales* do communicate one with another, by the Ease wherewith the *Flatus* passes from the *Vas Deferens* to the *Vesicula* of the same Side, and the Facility wherewith it is blown up, or Liquors are injected by a Syringe that Way. This proves that there is a Communication in Fact, and it is not sufficient to ask, Why Nature should choose to make this Seminal Liquor, as it were, turn back again, to ascend and fill the *Vesicula*, rather than to have inserted the *Vas Deferens* into the upper Part of it, and so to have fill'd it the more obvious Way? For tho' we should confess the Reason of such a Procedure to be strange and incomprehensible to us, yet that would not alter the Nature of the Fact. It should, indeed, caution us to be more modest in pronouncing concerning Particulars whereof we were not sufficiently inform'd, and rather incline us ingenuously to confess our Ignorance, and to wait till Time and farther Application, or the Industry of others, shall open to us the Mystery; than, when we cannot discover the real Way by which Nature operates, to fall to inventing, first the End, and then the Means, which has been an old, but a very disingenuous, Method of Philosophizing in *Physick*.

But the Difficulty before us, is neither so great, nor so puzzling, as to force Men into any such Shifts: For admit that the *Vasa Deferentia* be continued to the *Caruncles* in the *Urethra*, yet if the Neck of the *Vesicula Seminales* join them higher, and form together one *Tubulus*; or if it be but inserted into the *Deferens* with a patent Orifice, it is easy and natural to conceive, that the *Seed*, that is but gently protruded along the *Vas Deferens*, arriving at the *Caruncle*, should there

there be stopp'd, and the Protrusion still continuing, should rather deflect laterally into the *Vesicula*, which is open, altho' that may be call'd in some Measure remounting, than force the Obstacle of the *Caruncle*, whose Resistance is greater than that of the Weight of so much *Seed* as one of these *Deferents* will contain.

This is so far from being hard to be conceived, that it is the constant and regular Course of all Fluids, in such Cases. For Example; let us suppose a *Tube*, form'd in the Figure of a Y, or, which is all one, of the *Vesicula Seminalis* on the Left Side here figur'd.



- A. The Left Vas Deferens.
- B. The Right Vesicula Seminalis.
- C. The Place of their Communication, at which the Seed is reflected into the Vesicle.
- D. Their Common Orifice closed by a Caruncle instead of a Valve.
- F. The Right Vas Deferens cut through after having been inflated and dried.
- E, e. The Cells of the Vesicula Seminalis, as they appear in that State.

If you pour Water into *A*, it will readily descend to *D*; but if at *D* there be a Valve plac'd, which neither the Weight of the Water, nor the Force of its Direction, are able to overcome the Resistance of, then the Water will deflect at *C*, and rise up into *B*.

This simple Piece of Mechanism is what so many ingenious Men have stumbled at,

and thought themselves obliged to suppose several Sorts of *Seed* to be form'd in these uncommunicating Parts: A Trouble certainly they would not have put themselves to, if they had observed how easily the *Flatus* passes in a Body recently dead. But perhaps the ill Success of this Experiment tried upon a stale Body, when the Membranes were cold and stiff, and the Parts collaps'd and cohering, made these learned Persons maintain, that there was no Communication.

We shall not spend any Time in refuting that Doctrine of three Sorts of *Seed*, because it was apparently taken up to avoid this Difficulty. The *Seed* of the *Testicles*, and *Vesicula Seminales*, appear manifestly the same, and nothing was wanting to make them be allow'd so, but to prove the Communication. The *Prostatal Liquor* is by most acknowledg'd not to be true *Seed*, no more than that which is emitted by *Women*: Nor is there any good Reason, why any Body should call it so, the Appearance being so very different, and another sufficient Use found.

The learned Doctor *Wharton's* Ground of imagining a peculiar Sort of *Seed* to be separated in the *Vesicula* (which was his Observation of a great many Glandules in them, which he suspected to be the *Organs* through which the *Seed* was separated) would have been more material than the former, if those *Glands* which he mentions had been considerable for their Number or Magnitude. But they are so far from being sufficient for that Office, that they are not conspicuous, and by most other Anatomists have been unobserv'd. *De Graaf*, who sought for them expressly, denies their Existence. It seems therefore unreasonable to assign that Office to them, whilst their Existence is controverted.

However, it is not improbable that the *Vesicula Seminales* may be furnish'd with Glands as the *Vesicula Fellea* and *Urinaria* are: But then we cannot assign them any other Use, than those Glands have in their respective Parts, that is, to afford a *Mucous Lining*; with this Difference, that it is not to protect the Membrane from any *Acrimony* of the *Seed*, but to lubricate it, and facilitate the Expression of it, lest it should otherwise adhere to the Inside of the Membrane, as all viscous Fluids are apt to do, to the Sides of a dry Vessel.

Of the PENIS.

SYLLABUS

Præcipue observandorum in

Pene,	Cuticula.		
	Cutis.		
	Præputium.		
	Structura.		
	Ligamenta	{	Frænum.
		{	Suspensorium.
	Glandula	{	Inguinales.
		{	Præputiales.
		{	Mucilaginosæ Comperi.
	Corpora Cavernosa	{	Penis
		{	Urethræ
		{	Substantia,
	Bulbus----		ejus Septum.
	Glans.		
		{	Acceleratores Urina.
	Musculi	{	Directores
		{	Transversales
		{	Penis.
	Vasa	{	Arteria.
		{	Vena.
		{	Nervi.
		{	Lymphaductus.

THE *Cuticula* of the *Penis* differs not from that of other Parts, unless on the *Glans*, where it is very delicate and thin, and appears to have a smooth Surface, not rough and squamous, as that of other Parts, when view'd with Magnifying Glasses.

The *Skin* it self is not so thick as it is generally found on other Parts. The doubling of it on the *Glans* makes the *Præputium*. Nature does not seem more wanton in any Part of her Works than in this, especially the *Prepuce*, for the Figure and Proportion of which I can scarce find any Standard. From hence, perhaps, arose the Necessity of *Circumcision*, so generally practis'd in all the Oriental Parts, as well as among the *Jews* to this Day. The first of which use it out of Cleanliness, and to prevent Diseases, which the Detention of the *Mucus* of the *Subpræputial Glands* might breed in those hot Coun-

tries: For even here I have seen some, who having large *Præpuces*, such as they call *Filberd Præpuces*, who have been frighted at the odd Appearance of that *Mucus* ouzing out, upon meer Plenitude, from between the *Prepuce* and *Glans*. Perhaps the Great Lawgiver of the *Jews* had a Regard to this Convenience in the first Institution of *Circumcision*: For we still meet with a great many Instances, where that Operation, or something like it, is necessary. It is tied to the lower Part of the *Glans*, by a *Ligament* called the *Frænum*. In this also Nature varies, for it is often so short, that unless it be divided, it will not admit of perfect *Erections*.

At the Connexion of the other Part of the internal Skin of the *Præputium*, are divers oval and roundish little *Glandules* placed irregularly, and that not only in the Neck or Joining of the *Glans* to the *Corpora Cavernosa*, but on the *Glans* it self. By these *Glandules* is separated that Liquor that renders the Agitation of the *Præputium* on the *Glands* easy. When this Liquor becomes rancid, as it does in old People, and in *Veneral* Contacts, it excoriates the *Glans* and *Præputium*, and very often exulcerates, and renders the *Prepuce* liable to Contract, and obliges the Patient to have it divided. The Extremity of the *Prepuce* is apt to grow so strait in old Men, that they cannot bear the *Glans*, perhaps through the Defect of frequent *Erections*.

The other *Ligament* belonging to the *Penis* is called *Suspensorium*, from its Office, in holding up the *Penis* to the *Ossa Pubis*. It arises from the fore Parts of those Bones, and becoming thicker, divides for a Passage to the great Vein of the *Penis*, and is fasten'd to the upper Parts of the *Corpora Cavernosa Penis*, on each Side the great Vein of the *Penis*.

The *Penis* is naturally destitute of *Fat*, and when it happens to have any (as there are Instances) it is a Disease, and incommodes

modes it in the Execution of its Office. In Children you will commonly find *Fat* on the *Penis*, but in grown Bodies it's seldom found, tho' the *Membrane* between the *Skin* and *Corpora Cavernosa* remain; and it is not improbable, that frequent *Erections* may prevent their *Cells* being charged with the *Oil* which composes the *Fat*, as appears by the Microscope. This Want of *Fat* makes the *Skin* of this Part very loose and distensible, and the membranous Body between the *Skin* and *Corpora Cavernosa* divisible into several Coats, as appears when this Part becomes affected in an *Anasarca*, in which the Membranes of this Part and the *Scrotum* have been found thickened to more than three or four Inches. The external Teguments removed, the Body of the *Penis* offers it self: First,

The two *Corpora Cavernosa*, and the *Corpus Cavernosum Urethrae*, and their Vessels, frame the Body of the *Penis*. The two cavernous Bodies, by some call'd *Corpora Nervosa*, *Spongiosa*, &c. have two distinct Beginnings from the lower Sides of the *Ossa Pubis*, where they are smallest, which soon growing large and thick, join to each other where they meet with the cavernous Body of the *Urethra*, for which they leave an Interstice or Channel in their lower Side, wherein is received the *Cavernous Substance* of the *Urethra*. The superior Surface of those cavernous Bodies have a small Interstice or Channel also near the *Pubes*, in which the *Vena Penis* is lodg'd. Both these join by the Intervention only of a *Septum*: This, towards the back or upper Part of the *Penis*, is very thick and strong, and seems to be compos'd of the two outward thick Membranes, or Cafes of the *Corpora Cavernosa* join'd to each other. The other Extremities of the two *Corpora Cavernosa* are Capt with the *Glans*.

The third cavernous Body of this Part is called *Corpus Cavernosum Urethrae*, because the *Urethra*, or Passage of Urine in the *Penis*, is inclos'd with it. Its external Figure differs very much from that of the two *Corpora Cavernosa*, for whereas they are lessened at their two Extremities, this is there largest, and lessened in its Middle. Its upper Part, that is placed between the two Beginnings of the *Corpora Cavernosa* before they unite, I call, after Mr. Cooper, its *Bulb*, from its Figure,

which is large, thick and round, not unlike a Clove of Garlick, or an Onion. Its external Membrane is here very thin, and it is divided according to its Length, by a *Septum* that is thickest toward the *Urethra*, which is not compass'd with this cavernous Body, till it passes under the two *Corpora Cavernosa* at their Meeting. This bulbous Part of the *Corpus Cavernosum Urethrae*, is placed in that Part called *Perineum*, which is between the *Strotum* and *Anus*, and is cut through to come at the *Urethra*, in the Operation of Cutting for the Stone in the Bladder. It is cover'd with the *Musculus Accelerator Urinae*, of which elsewhere. The middle Part of this *Corpus Cavernosum Urethrae* is almost cylindrical, but the Passage for the Urine is not through its Center, but inclines to its upper Part next the Body of the *Penis*.

The other Extremity of this *Corpus Cavernosum Urethrae* is again dilated, and makes that Body called the *Glans*. Its external Figure is well known: It receives the Extremities of the *Corpora Cavernosa Penis* in a Cavity or Depressure of it. Its internal reticular Substance is closer than that of the *Penis*. The Symmetry of these Parts being known, we come next to treat of their Vessels and internal Structure. First of

The *Arteries*, which arise sometimes from the internal *Iliac* Branches, but most commonly from the lower Parts of the *Umbilical Arteries*, whence it is, perhaps, that this Part is less than usual, by tying the Navel-string too close, not only by the Retraction of the *Urachus* through its Continuity with the Bladder, and consequently the *Penis*; but the *Arteries* of the *Penis* springing from the *Umbilical* are liable to Coarctation, if they are over-extended, whereby the requisite Plenty of influent Blood is denied the *Penis*. Before these *Arteries* reach the *Penis*, they commonly send out two or three Branches on each Side, the two inferior of which carry Blood to the *Musculi Directores Penis*. The two superior convey Blood to the adjacent Parts, particularly to the *Musculi Levatores Ani*, between which and the *Musculi Marsupiales Femorum* these great Trunks pass; but marching over the cavernous Bodies of the *Penis*, they are both subdivided into two large Branches, the two inferior of which, it is, pass to the *Bulb* of the cavernous Body of

the *Urethra*; but the two superior, *kk*, are both sub-divided again; the external, *dd*, running on the superior Surface of the *cavernous Bodies* of the *Penis*, the intenal, *ll*, entering their *Capsula*, pass through the Middle of each *cavernous Body*, *DD*, wherein they divide into innumerable Branches; from whose capillary Extremities are continued so many *Veins*, in the Channels of which are divers Apertures into as many *Cells*, *D*, that communicate with each other, that empty themselves into larger Venous Ducts, *E*, running on the superior Surface of the *Penis*, some of which join with the *Veins* of the *Prepuce*, *dd*; others make one large Trunk, which is called *Vena Penis*, *M*, marching on the *Dorsum Penis*, immediately under the *Ligament* that ties the *Ossa Pubis* together internally; by which *Ligament* that *Vein* is compris'd in an *Erection*, as shall be shewn by and by: But this *Vein* proceeding further on the *Prostate*, it is there divided, and enters the *internal Iliack Veins* on each Side. The *Veins*, which arise in like Manner from the *Corpus Cavernosum Urethrae*, pass from its *Bulb* through the *Musculi Acceleratores*, *CC*, and are compris'd by those *Muscles*.

The *Nerves* spring from a Trunk composed by the Coalescence of the third of the *Os Sacrum*, and a Branch remitted from the great *Crural Nerve*, which, after their Union, provide *Nerves* for the *Testes*, *Perinaeum*, and *Muscles* of this Part; which ascending on the *cavernous Bodies* of the *Penis*, expand themselves on its upper Surface, *cc*, and are afterwards distributed to all the Parts of the *Penis*.

The *Lymphaducts* of the *Penis* are very numerous on its Surface under the Skin, in that loose Membrane that is in the Place of the *Membrana Adiposa*. If you blow into the *Veins* of a Dog's *Penis*, its *Lymphaducts* will be inflated after its *cavernous Body* is extended: These, like the *Lymphaducts* of the lower Parts, discharge their *Lympha* into the *Glandula Inguinales*. Hence, perhaps, the morbid Matter in *Claps* is transferr'd into these *Glands*, and causes those *Tumors*, called *Buboes*, from the *Glands* call'd *Bubones*. On this Account the opening these *Tumors*, before the usual Time for *Suppuration* in other *Tumors*, appears necessary, lest the peccant Matter be convey'd by the exporting *Lymphaducts* of

those *Glands* into the Mass of Blood; of which we meet with too many Instances.

The internal Structure of the *Corpora Cavernosa*, agrees exactly with that of the *Spleen*: The *Arteries* of the *Penis*, after they enter its *Corpora Cavernosa*, are distributed into its *reticular Substance*, which are chiefly composed of *membranous Filaments*, deriv'd from the *Capsula* or Sides of the *Corpora Cavernosa* or their *Septa*. These *Filaments* are variously intertext with (as they pass from the Sides of the *Corpora Cavernosa*) and support the Ramifications of the *Blood-Vessels* and *Nerves*. The *Veins* of the *Corpora Cavernosa* do not pass from it, as they commonly do from other Parts, in particular Channels; but their Sides are here punch'd with numerous Holes, that open into this *cavernous Substance*, which have such Communications, as that if you blow into either Peginning of the *Corpora Cavernosa*, they both are readily distended; but the *Corpus Cavernosum Urethrae* will not be affected, tho' the other two are distended with Wind, unless in some Subjects, (which is very rare) in whom the *Veins* happen to let the Wind pass from the *cavernous Bodies* of the *Penis* to that of the *Urethra*. From this Structure of the *Penis*, we may be inform'd of the particular Use of its Parts.

This Structure shews that the *Penis* is strictly an Organ of Generation only, and that the Conveyance of *Urine* was not considered by Nature in this Mechanism, that being as well answer'd in Birds, Women, and all Female Creatures, another Way. But an Incitement to the Propagation of their Species had perhaps been wanting, but for this Organ; tho' the Way of Propagation in most Kinds of Fishes seems to argue the contrary. But of that we shall have Occasion to speak more at large hereafter. At present it may suffice, that without such an Instrument the Seed of the most perfect Animals could not be convey'd to the Place of Prolification; and that an Alternation, as Occasion requires, of *Erection* and *Flaccidity*, was absolutely necessary; the first, to the Performance of its Office; the latter, for the Security of the Part: Since without an *Erection* it were impossible to emit, and lodge the Seed where it ought to be; and with a constant One, almost as impossible to secure the Part from many,

many of those Injuries to which it would be perpetually expos'd; not to mention the Loss of Lustigation, which must be a necessary Consequence of constant Erection.

That the Blood is the Matter which distends the *Corpora Cavernosa Penis* in an Erection, is manifest from abundance of Experiments, tho' the most certain is that of firmly tying the *Penis* of any Animal (as has been done frequently to a Dog) in *Coitu*, in which nothing but Blood has been found that distended it. In the Bodies of Criminals that hang long after Death, the *Penis* becomes erected, the Blood in that Position falling to the inferior Parts, and stopping there. By blowing into the Blood-Vessels after Death, the *Penis* becomes erected.

This was first observ'd by the accurate Mr. Cowper, upon viewing its *Veins*, after he had distended them with Wind; whence it was very plain, that the external *Trunks* pass'd some under its *Skin* only, and some over the *Ossa Pubis*; which, for Distinction, he called *Vena Preputii*. Besides these, a vast Number of *Veins* (on the *Dorsum Penis*) unite, and empty themselves into one *Trunk* called *Vena Penis*, which passes immediately under a transverse Ligament of the *Ossa Pubis*, and is compress'd by the Approximation of the *Dorsum Penis* to the Ligament of the *Pubis*. This Application of the *Dorsum Penis* is effected by its *Musculi Directores*, pulling down the *Crura* of the *Corpora Cavernosa Penis*, which are tied up at their Junction in the Body of the *Penis*, to the *Ossa Pubis*, by the *Ligamentum Suspensorium* above-mentioned.

This cannot happen to the *Cavernous* Body of the *Urethra*, because there is no Bone, whose Position (in *Humane* Bodies, and most *Quadrupeds*) can give Rise to a Ligament, which can have that Effect on its *Veins*. Wherefore the *Musculi Acceleratores*, embracing the *Veins* of the *Bulb*, do that Office, though not so effectually as in the *Penis* it self; whence it is that the *Glans* is not always perfectly distended with the *Penis*, and soonest becomes flaccid on an Erection.

The Blood, by these Means, being hinder'd in its Return, the *Corpora Cavernosa* must necessarily be distended, if we consider the Structure of them above-mentioned, with

Respect to the *Veins*. The *Arteries*, which before were flaccid, have now their *Trunks* also extended, and do more plentifully import Blood into the *Corpora Cavernosa*. But since it is absolutely necessary some Part of the detain'd Blood should be still passing off, lest it becomes grumous and unfit for a Reflux, the *Vena Preputii* communicate with those of the *Penis* it self, as before observ'd; whereby Part of the Blood may be returned from the *Penis* during its Erection, and give Way to a fresh Supply from the *Arteries*, and preserve the Circulation in it uninterrupted. By this we are taught how to relieve an obstinate *Priapism*, by opening the *Vein* of the *Penis*.

This admirable Contrivance, in disposing these exporting sanguiferous Ducts, so that some are compress'd, whilst others remain altogether free and open, is not only seen in the *Penis* of Men, and *Pudenda* of Women, but in those Parts of all other Animals that have fallen under our Examination, with some Difference of Instruments only in some particular Creatures; as Mr. Cowper has instanced in the *Male Opossum*, *Philosophical Transactions*, N^o 290. P. 1584. This Retardation of the reflux Blood is chiefly continued by Means of a *Sphincter Muscle*. In a *Male Porpus*, long since dissected by Mr. Cowper, were found two Bones, with their Ligaments, framed on Purpose for this End. In a Dog he some Time since observed likewise a *Digastrick Muscle*, whose middle Tendon pass'd transversly on the *Veins* of that Animal's *Penis*, which seemed to be provided by Nature, that when in *Coitu*, tho' the Dog is turn'd off the Back of the Bitch, and his *Penis* drawn off from the *Ossa Pubis*, which, without that transverse Muscle, would make Way for the Blood to pass off, and let its *Bulb*, by which the Dog is tied to the Bitch, grow flaccid.

The *Muscles* of the *Penis* are two Pair, and one odd Muscle; the first, that offers it self in Dissection, is the *Accelerator Urinae*, which appears on dividing the *Skin* and *Fat* in the *Perineum*. It is often joined with the *Sphincter Ani*. It arises tendinous, but soon grows fleshy, from the upper and fore Part of the *Urethra*, as it passes under the *Ossa Pubis*, its fleshy Part encompassing the *Bulb* of the *Corpus Cavernosum Urethrae*. Both Sides of this

Muscle meet in a middle Line, corresponding to the *Seam* in the Skin over it. It continues so united about two Inches in Length, then detaches two fleshy *Elongations*, *c c*, which become thin *Tendons*, at their Terminations on the *Corpora Cavernosa Penis*. This is commonly made a Pair of *Muscles*, but in Truth is but one *Muscle*. Its upper Part, that covers the *Bulb*, when in Action, strengthens the *Veins* that pass through it from the *Corpus Cavernosum Urethrae*, and hinders the *Reflex* of the *Blood* in an *Erection* of the *Penis*, and by the repeated Contractions of this upper Part, drives the *Blood* in the *Bulb* towards the *Glans*. The two *Elongations*, that part on the *Urethra*, and ascend to their Terminations on the *Corpora Cavernosa Penis*, so compress its Channel, as to force out the contain'd *Seed* or *Urine*, from which latter Use it has its Name.

The *Erectores Penis*, so called from their Use, spring fleshy each from the *Os Ischium*, below the Beginning of the cavernous Body of the *Penis* on the same Side, and after an oblique Progress, end partly tendinous, and partly fleshy, in the Beginning of that cavernous Body. When these act, the *Penis* is drawn to the *Pubes*, and, by Means of the *Ligamentum Suspensorium Penis*, its great *Vein* is applied to the transverse *Ligament* of the *Ossa Pubis*, and the reflux *Blood* hindered from passing that Way, whereby its *Corpora Cavernosa* become distended. The last Pair of *Muscles* that belong to the *Penis*, are called, from their Position,

Transversales Penis. These are often wanting, and frequently vary in different Subjects: Sometimes they are deriv'd from the *Sphincter Ani*, and terminate in the *Bulb* of the cavernous Body of the *Urethra*. At other Times you'll meet with a *Muscle* on one Side only. But ordinarily they arise from the *Ischium* near the former, and are inserted on both Sides the *Corpus Cavernosum Urethrae*, immediately below its *Bulb*. When they act, they dilate either the *Bulb*, or that Part of the *Corpus Cavernosum Urethrae*, to which they are fasten'd.

There remain yet to be accounted for, three small *Glands* discover'd by Mr. *Conper*, and not yet taken Notice of by any other Anatomist. They all empty themselves into the *Urethra*, and are by Mr. *Conper*, from the Te-

nacity of the *Liquor* which they separate, called the *Mucous Glands* of the *Urethra*. The two first discovered of these are about the Bigness of a *French Bean*, of a depressed oval Figure, of a yellowish Colour like the *Prostates*, and lie on each Side the *Bulb* of the cavernous Body of the *Urethra*, a little above it, *G G*. Their *Excretory Ducts* spring from their internal Surface *Ab*, next the inner Membrane of the *Urethra C*, whence descending about half an Inch, they begin to grow less, and piercing that Membrane obliquely, open into the *Urethra* at *D*, by two distinct *Orifices*, just below its Bending, under the *Ossa Pubis* in *Perinaeo*, where they discharge a transparent viscid *Liquor*.

Besides this Pair, there is a third *Mucous Gland*, discover'd likewise by the same Mr. *Conper*, to whose happy Sagacity, Industry, and communicative Temper, the Inquisitive into this Part of Knowledge are infinitely indebted. This is describ'd by him in the Appendix to his *Εργασια*, and is a small conglobate yellowish *Gland* like the former, but somewhat less. It is situate about the Angle of Flexure of the *Urethra*, under the *Ossa Pubis* in the *Perinaum*, near the *Anus F*, as it was drawn from a Preparation which Mr. *Conper* has still by him. To find this *Gland*, the *Corpus Cavernosum Urethrae* must be divided lengthways to the inner Membrane of the *Urethra*, which must be cautiously freed from the Body; which done, the *Gland* will appear in the Place already mentioned. It has two *Excretory Ducts*, which enter the *Urethra* obliquely about a Quarter of an Inch below the *Orifices* of the two former, *K*, and discharge a *Liquor* like theirs both in Colour and Consistence.

Mr. *Conper*, who is always ingenious, and generally right in his Conjectures about Anatomical Matters, thinks there may be two Uses of this *Mucus*: The First, to hinder any Remains of *Urine* from mixing with the *Semen* in the *Urethra Tempore Coitus*, which I can find no Reason to expect there at that Time. Yet I must subscribe to his Opinion, that the main Design of Nature in framing these *Glands* seems to respect the grand Work of Generation. For by their Situation they must necessarily be compress'd upon *Erection*, and consequently discharge their Contents before the *Testes* and *Vesiculae Seminales*, which are not

not subject to so immediate a Force. I apprehend therefore, that their *Mucus* serves to lubricate the Pipe of the *Urethra*, and thereby to facilitate the *Emission* of the *Semen*, and render it more vigorous and projectile than otherwise it could probably be, if so viscid a Liquor as the *Semen* were to pass through a Channel absolutely dry, to which it would be apt to adhere, and so its Projection be obstructed.

Much less can I think, that they were by Nature contrived to defend, by the *Mucus* which they afford, the *Urethra*, from the Acrimony of the *Urinous* Salts: For, to answer that End, the *Urethra* should be constantly lin'd with it, and the Discharge continual, as it is in a *Gleet*, when the *Caruncula* which closes the *Excretory Duct* of any of these *Glands* happens to be eroded, as we observ'd it once in a Servant of mine; of which Mr. *Comper* has given us the History, and the Figure, in his *Description of these Glands*, publish'd before his *Euxasia*, both which I have thought worth the transferring hither. But as these *Glands* do not emit their Liquor in *Statu Sano*, but upon Compression, which cannot happen but in Erection, and that a pretty stiff one too, by reason the Resistance of the *Caruncle* must be forced, it is not probable that this Liquor should be always discharged previous to the *Urine*, which is as often made with a *flaccid Penis* as otherwise. Nor indeed do I see any need to hunt for any other Use than that which I have assign'd in the preceding Paragraph.

Mr. *Comper* having, with his Description of the first discovered Pair of the *Glands*, hinted his Suspicion, that an *inveterate Gleet* might proceed from a *Veneral Ulcer* happening upon the *Ostium* of either of these, whence, if an absolute *Erosion* of the *Caruncle* ensued, an *incurable Gleet* might follow, an Opportunity presented it self to me to examine into the Certainty of that Opinion, in a Servant of mine who died of a *Peripneumony*, but had been some Years troubled with an obstinate *Gleet*. In this Subject we found that the *Caruncle*, which should have closed the *Duct* of the *Mucous Gland* on the Left Side, had been eroded by an Ulcer, and the Orifice of that, and of the Left *Duct* of the single *Mucous Gland*, laid into one, as appears by *Tab. IV. Fig. I.* drawn from it by Mr. *Comper*. Hence proceeded an almost constant Dripping of a diaphanous, viscid, roapy Liquor, such as these *Glands* furnish, which is what we call a *Gleet*, and must necessarily happen to all Persons under the like Circumstances.

He that considers, that a *Clap* is nothing but an Ulcer rais'd in the *Urethra*, by the Insinuation of some *Virulent*, or, to speak more properly, *Acrimonious* Purulent Matter into it, will not wonder, that it should often hang and fix its Seat at the *Ostium* of these *Excretory Ducts*. But of these Matters, I shall take another Occasion to speak more largely,

Of the Parts of Generation in Men, and the Diseases
subject thereto, particularly those of the Penis. From
Verheyen, St. Hilaire, &c.

THE Parts which serve for Generation are called the *Pudenda*, the bashful or modest Parts, and are divided into two Kinds, the Common or Proper; the Common Parts are such as are found in both Sexes, as the Spermatick Vessels, the Testicles, and the *Vasa Deferentia*; the Proper Parts are those which are common to Men, as the *Parastata* or *Epididymida*, the Seminal Vessels, the *Prostata*, the Yard; and so the Womb to the Female. Many Authors are of Opinion, that all these Parts deserve the Title of Noble as well as the Brain or the Heart, because the Brain and the Heart only are instrumental to the Preservation of the Individual, but that these Parts serve for the Propagation of the whole Species.

The Parts which first appear in Man are the Spermatick Vessels, which are four, to wit, two Arteries and two Veins: The two Spermatick Arteries spring from the Trunk of the *Aorta*; the Spermatick Veins arise from the Testicles, to empty themselves into the *Vena Cava*. The Artery and the Vein, whercof one rises and the other descends, on each Side approach one another, and are covered from the *Peritonæum*. The different Branches which the Vein produces in Ascending, Winding and Turning, forms that *Plexus* which is called the *Pampiniforme*, varicous or pyramidal Body, the Artery contributing nothing towards it.

The Spermatick Vessels are larger in Men than in Women, and yet some of those in the same Subject larger than others, for the Arteries are larger than the Veins; and the Reason remains to be enquired into why the Left Spermatick Vein is inserted into the Emulgent, and not into the Trunk of the *Vena Cava*, as the Right is. These two Ar-

teries, and these two Veins, were called by the Ancients the *Vasa preparantia*, or preparing Vessels, because they believed that the Seed began to be prepared there, and for that Reason they supposed that the Vessels were united together by sensible Apertures, which they called *Anastomoses*, by Means of which they fancied there was a Mixture made of the Arterial with the Venal Blood, and that stopping there for some Time in the Pampiniforme Bodies, they might receive the first Tincture of Impression of the *Semen*.

But the Principal the Moderns follow is directly opposite to that Error, since they apprehend that the Blood is directly carried by the two Arteries from the Testicles, and that if these divide themselves each into two small Branches a little before they enter, it is in order the better to penetrate their Substance in gaining Admission at several distinct Parts, and that the Particles of the *Semen* which the arterial Blood carries along with it might be more exactly separated. Hence the Circulation makes it appear, that the Residue of this Blood is carried back by the Spermatick Veins into the *Vena Cava*, and that there is no *Anastomoses* of the Arteries with the Veins, not only in this Part, but in no other of the whole Body.

The Testicles are such of the Genital Parts as are contained in the *Scrotum* or Bag, and hang out of the *Abdomen*, being appointed to elaborate the Seed; and they are called *Testes*, because they are the Evidences of Manhood. They are otherwise called *Didimids*, that is to say *Twins*, because they are usually Two, for it is rare to meet with Three, or to find no more than one; notwithstanding there is a credible Report goes of an Illustrious Family in Germany, the Males where-
of

of have always Three, and they are reckon'd more than ordinarily vigorous in the Act of Coition. They are seated at the Root of the Yard in the *Scrotum*, to stop the natural Heat from encreasing too much upon them from the Lower Belly, which would render Men too lascivious; for Experience shews, that those Animals who have their Stones within the Body, are much hotter, and more fruitful, than others. They are much of the Shape and Size of a Pigeon's Egg, and sometimes like that of a Hen's, being on each Side something flat; but we may nevertheless observe some Difference, according as the neighbouring Vessels are more or less tumefied. Commonly the Left is a little larger than the Right, and hangs something lower, and it rarely happens that the Right is any Thing bigger than the Left. It happens in the Venereal Disease, that sometimes one of the Stones, and sometimes both of them, are swell'd, and become much larger than ordinary; and this Swelling, after the Cure of the Malady, returns to its former Condition without much Damage.

The Tunics or Coats which inclose the Testicles are Five; viz. Two Common, which are, the *Scrotum* and the *Dartos*; and Three Proper, which are, the *Eritroides*, the *Eliroides*, and the *Albugineous*. The First of the Common is the *Scrotum* or Purse. It is composed of a Cuticle and a Skin, which is much finer and thinner in this Part than in any other of the Body. It is soft, wrinkled; and without Fat, being covered with Hair at about Fifteen or Sixteen Years of Age. It is divided into the Right and Left Part by a Line or Suture, which begins at the *Anus*, and passes through the *Périneum*, ending at the *Glans*. The Second Common Membrane is called the *Dartos*: According to the Ancients, it was a Continuation of the Flethy Pannicle; but agreeable to the Moderns, a cutaneous Muscle composed of several carnis Fibres; and it is by Means of this Muscle that the *Scrotum* is contracted, and drawn up into a Purse. The First of the proper Coats is the *Eritroides*, that is, the Red Coat. It is made up of fleshy Fibres, which makes it look Red, and is produced by the *Suspensor* or *Cremaster* Muscle of the Testicles. The Second is the *Eliroides*. It is like a Pipe.

Hence it is called the Vaginal. It is formed by the Dilatation from the Production of the *Peritonæum*. The internal Superficies is even and smooth, the external rough. The Third is the *Albugineous* Coat, so called because white. It is nervous, strong and thick. This is what immediately covers the Substance of the Testicle, and takes its Rise from the Coats which inclose the Spermatick Vessels.

The *Testicles* are of a particular Substance, and that which is like no other in the whole Body besides. It is white, soft and lax, because it is composed of several little Seminal Vessels, and a great Number of other Capillaries, which are from the Branches of the Arteries, Veins, Nerves, Lymphaticks, and the Roots of the *Vasa Deferentia*. The Substance of the Testicles is no otherwise form'd than as a Piece of Weaving, or a Contexture of an infinite Number of minute Vessels, whose Structure is surprizing. There are Two Muscles belonging to the Testicles, which are the *Cremasters* or *Suspensores*, which take their Rise from the Point of the *Os Pubis*; or, as *Riolan* will have it, from the fleshy Extremity of the ascending Muscle.

The Use of the *Testicles* is to filter the Seed, and to separate it from the Blood. It is no difficult Task to explain how this Filtration is made, if we do but observe what has been said concerning the Structure of the Testicles; for as soon as we know that they are composed of Arteries, Veins, and an infinite Number of small Seminal Vessels, which have a Communication with the Roots of the *Vasa Deferentia*, we cannot doubt that the Arteries convey a Liquor in them composed of Blood and Seed, which is separated by the smaller Seminal Vessels. This Seed being so separated, is received by the Roots of the *Vasa Deferentia*, which conveys it from the Testicle into the *Epididymis* or *Paraftata*, from whence it passes afterwards into the same Trunk from the *Vasa Deferentia* which discharges it self into the Seminal Vessels, where it rests to be ejected.

The *Epididymide* or *Paraftata* are small round Bodies, which arise from one of the Ends of the Testicle. They are likewise so called, because of their resting upon the Testicles, which are called *Didymes*. They are

are like to a Silkworm, and are strongly tied to the *Tunica Albuginea* of the Testicle. Their true Use is to receive the Seed separated in the Testicle, to prepare it further for its Return, and to convey it by little and little into the Trunk of the *Vasa Deferentia*.

The Seminary or Seminal Vesicles are like little Cells, disposed after the Manner of those of Raisins, which receive the *Semen* that flows into them from the Testicles by the *Vasa Deferentia*. Their Figure resembles that of the Guts of Birds, which dilate in some Places in their Circumvolutions, and contract in others. They are composed of a thin Membrane, with an Artery, Vein and Nerve, that are very fine; and some believe they are made up with Lymphatick Vessels. Their Size is of a Finger's Breadth, and the Length of three, or thereabouts; but they are most commonly bigger on one Side than the other; and are seated on both Sides before the Ligaments of the Urinary Bladder. They are double, to supply any Accident that may happen by Wounds, Tumours, Lithotomy, or any other Cause whatever, whereby Generation may be prevented, and the Male rendered useless to Posterity.

There are several Cavities or Hollows, which are like a Bundle of various little Cells form'd in the Manner of a Grape, and which exactly resemble the Cells of Pomegranate Seed, so that all the *Semen* cannot pass in any one single Action, but that the best remains in the turning and winding of the Passages.

In the Part or Place where these narrow and obscure Pipes or Conduits discharge the Seed into the *Urethra*, there is a small Membrane stretch'd in Form of a Valve, seated in such Manner, that it shall not hinder the *Semen* from flowing from the Vesicles, but only to stop it from entering into the Urinary Bladder.

The Causes of a *Gonorrhæa* are either the Erosion or Excoriation of the little Channels, or else the more invisible Pores, by the Acrimony of the *Semen* contracted in an impure Coition; or if the Vessels are weakened, they become from hence the more relaxed, as it happens sometimes in Old Persons, who force Nature by using too much Venery. *Vesalius* and *Spigelius* have found in dead Bodies that have been affected with the *Gonorrhæa* the Passages or Channels very much dilated.

Galen and *Higmore* will have it, that these Vesicles diffuse into the *Urethra* a certain Oily Humour, which moistens the Passages, and makes them slippery; so that they are not easily injured by the Acrimony of the Urine or Seed: But *Diemerbroek* asserts positively, that these Vesicles contain nothing of Seed in them, and that the Moisture or Slipperiness of the *Urethra* does not proceed from any Oily Humour supplied from these Vesicles, but otherwise; to wit, from some mucilaginous Portion of the Aliment which is bestowed upon the Bladder, the Guts, and several other Parts of the Body.

Of

Of the Diseases subject to the Parts of Generation in Men. From the same Authors.

THE Testicles are sometimes affected with an Intemperature, with an Inflammation, Ulcers and Contusions. The Intemperature easily communicates it self to the preparing Vessels. The internal Causes are, the Intemperature of the principal Parts that are affected by the Spirits and Humours, acrid, bilious or pituitous: The external Causes are, Air, Diet, Drink, and such like Things. This Disease is known, first by the Causes that precede it, and next by the Effects that follow after. There is a great Burning perceived in the hot Intemperature, and a great deal of Coldness in the contrary. The Intemperature of these Parts is a great Enemy to Generation, the cold and the dry occasioning Barrenness, and are more difficult to cure than the moist and the hot.

When the Nutritious Juice and the Seed becomes acrid, as it happens in the Venereal Disease, the Testicles are inflamed and swelled, which is occasioned by the Obstructions that are made in the Parts, which hinder the Motion of the Fluid, and stops it from returning back into its proper Channels again; and it is easy to see, by the Texture of the Testicles, that what has Power to produce Obstructions, is capable of raising the Inflammation. Likewise the Corruption of the Seed may be the Occasion of such a Tumor. This we see every Day happen to those who have the Pox, and in the *Gonorrhœa*, because the *Parastata* and Seminal Vessels are ulcerated, and the Fermentation of the vitiated *Semen* will make the Testicles grow larger, harder, and produce a *Scyrrhus*. Besides, if the Matter remain upon the Part 'till 'tis acrid, so that it brings on an Obstruction, it frets the little Tubes so, that the Liquor flows out and extravasates, which spreading about produces Excrencies of Flesh called the *Hyper sarcosis*, or *Sarcocoele*, which considerably

adds to the Bulk of the Testicle. The Inflammation is known by the Redness of the Tumor, by the Heat and pricking Pain, by the Redness and Swelling of the *Scrotum* on that Side the Pain lies, and by the Fever that usually attends.

The Scyrrhous Tumour is known by the Sight and Touch, as likewise by the Want of Pain, Heat, and the Fever. The Inflammation and the Tumour of the Testicles is to be dreaded, because of the Accidents that attend it. There happens sometimes an Abscess and a *Scyrrhus*, for Want of present Application of resolving or discussing Remedies. If the Vessels of the Testicle are broke, and that the extravasated Liquors coagulate themselves together by the Mixture of different Fluids, there happens an *Hyper sarcosis*, which is often incurable: Therefore the Inflammation of the Testicles ought not to be neglected, because it may terminate in an Abscess, from whence we may be apprehensive of a *Gangrene*.

The Tumor which arises from nothing but Wind, and is very well known by Feeling, is no Ways dangerous or difficult to cure; but on the contrary, that which is produced by acrid Humors, is not so very easy. The Ulceration succeeds sometimes after the Inflammation, because in the Inflammation the Vessels of the Testicle are so tender they often break, and so the Nutritious Juice flows out, and being once extravasated, it ferments, grows acrid, pricks and tears or frets the neighbouring Parts, which afterwards turns into a considerable Ulcer, as is frequently seen in scorbutick and pocky Cases; and sometimes from a single Erosion of the Testicle there is a cancrus Ulcer made, which wasts or consumes all the Substance. This Ulcer is easy to know, for it emits a white Pus; but it is very difficult to cure.

The Contusion of the Testicle is caused by some Blow, Fall, or Cold. When it is considerable, so that the Substance of the Testicle is open upon the Vessels, there happens an *Hamorrhage* or Flux of Blood, and the Patient is sensible of a great deal of Pain, occasioned by the *Vaginalis* that incloses the Testicle, and by the *Spermatick* Vessels. This Inconvenience is very dangerous, because it sometimes leaves a *Scyrrhus* Tumor behind it that is troublesome a Man's Life after : But what is more to be feared, is the Mortification.

The *Scrotum* or *Cod* is liable to several Indispositions, but particularly to the *Hernia*, to Inflammations, Excoriations, Ulcers and Wounds. The Species or Kinds of the *Hernia* of the *Scrotum* are, the *Epiplotele*, and *Enterotele*. The other Tumors, which are improperly called *Hernia's*, are, the *Hydrocele*, the *Pneumatocele*, *Sarcocele*, and *Cirsocele*. The *Epiplotele* is a falling down of the *Epiploon* or Caul into the *Scrotum*, and the *Enterotele* is that of the Guts. These two *Hernia's* are easy to know : There appears a considerable Swelling, with much Pain, but the Tumor is of the Colour of the Skin. Sometimes the Parts fall at one Stroke into the *Scrotum*, and sometimes the Tumor begins by a *Bubonocèle*. The Patients feel a griping Pain, vomit their Excrement, but chiefly the Aliment, when the Guts cannot be return'd into the Belly. We distinguish the *Epiplotele* from the *Enterotele*, because the *Epiploon* or Caul makes such a Tumor as is found more uneven than that which is made by the Intestines, and more painful in the returning it from the *Scrotum* ; for the Guts, when they are put back, will make some small Noise, which the Caul does not.

The *Hernia's* of the *Scrotum* are dangerous, because of the Difficulty which is oftentimes met with in making them re-enter the Belly, and the strangling of the Gut, which occasions a *Miserere*, and a Gangrene. It is observable, that the *Caul* sometimes grows very large, and that its own Weight will tear it from the Intestines, and occasion it to drop into the *Scrotum*. The *Hydrocele* is an aqueous or watery Tumor, caused by the Rupture or Breach of the Lymphatick Vessels, which comes from an internal Cause, like the Dropsy of the Belly ; or rather from

an external Cause, as a Fall or a Contusion, because that the Blood by stopping and coagulating in the Parts makes Way for the *Serum* to separate. If the *Hydrocele* be the Consequent of a dropical *Ascites*, the Operation will be to no Purpose, because the Water is continually falling down from the Belly into the *Scrotum*. All the *Hydroceles* which do not succeed an *Ascites*, proceed commonly from the Lensor of the Blood's Motion, or from its Dissolution. Falls and Contusions may likewise contribute to their Rise, because the Blood standing upon the Parts makes Room for the Separation of the *Serum*.

The *Pneumatocele* is sometimes a Consequent of Convulsions in the *Scrotum*. These convulsive Motions contract the *Dartos* and the Skin. Likewise Transpiration is stopped, and the extravasated *Lympha* is rarified by the Heat of the Part. This *Pneumatocele* is easy to be known ; the *Scrotum* is stretch'd like a Football, we may perceive a little Noise when we strike upon it. Neither is it difficult to cure when the Tumor is fresh and new ; but if the *Tension* of the *Scrotum* is considerable, and that this convulsive Tension remain long, we may be apprehensive of ill Success.

The *Sarcocele* is a fleshy Tumor that is hard and livid, caused by the Contusion and Strokes of the *Scrotum* and Testicles ; for the Blood stopping there, and gathering together more plentifully in the wounded Fibres, and the Pores relaxing from the Vessels that are torn off, it changes it self into a Kind of Flesh, which increases successively in the Testicles or in the Membranes of the *Scrotum*, where it generates the *Sarcocele* or *Dartos* according to some Authors.

The *Cirsocele* is nothing else but a Tumor full of thick *varicous* Knots, that are hard and round, made from the Dilatation of the Vessels of the *Scrotum* and the *Testicles*. The Knots are called *varicous*, because they arise after the same Manner as the *Varices*. We might add to all these Kinds of false *Hernia's* that which is called the *Spermatocèle*. It is a Tumor made by abundance of Seed, which by Fermentation dilates the ejaculatory Vessel and the *Epididymis* ; so that in feeling the Testicle we perceive the *Epididymis* and the *Vasa Deferentia* wrinkled and *varicous*.

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The Inflammation of the *Scrotum* is produced the same Way as that of other Parts. It is known from its Tumor, Redness, Heat and Pain; and it is observable, that it is sometimes attended with a Fever. The Excoriation of the *Scrotum* is occasioned by the Acrimony of the *Lympha*, which ulcerates the cutaneous Glands of the Skin of that Part, and creates a Burning Pain. The Ulcer differs not from the Excoriation but as it is less or greater. The Inflammation, the Excoriation, the Ulcers and Wounds of the *Scrotum*, are Symptoms that are not to be neglected, for fear of the Gangrene.

The principal Diseases which attend the *Penis* or *Yard* are, the *Lipodermus*, the *Phymosis*, *Paraphymosis*, *Priapisme*, *Salyriasis*, *Emphyseme*, the Inflammation, Warts and Ulcers. The *Lypodermus* is when there is no *Prepuce* that is liable to a Wound or an Ulcer. There is besides this an *Hypodermus*, which is when the *Prepuce* descends below the *Glans* or *Nut*, which comes from a convulsive Motion of the *Prepuce*, occasioned by an extraordinary Agitation of the Spirits. These Symptoms are not dangerous, but they procure a great deal of Pain and Uneasiness to the Patient.

The *Phymosis* is when the *Prepuce* or Foreskin will not slip over the *Glans*. Sometimes this is natural; for when it happens so that the Gland is wrapp'd up or enclosed in the *Prepuce*, it cannot be disengag'd or freed by any Exercise or Handling; for sometimes the *Prepuce* sticks so close to the Gland, that it stops the flowing of the Urine. Sometimes this Indisposition is accidental, caus'd by some Inflammation, by Cancers, Warts, Induration of the Part, and sometimes by Medicines improperly applied.

The *Paraphymosis* is when the *Prepuce* sticks under or behind the Gland, without being able to be drawn over or to cover it. The Cause of this Strangulation proceeds frequently from the Foldings of the Skin that form a Kind of Purse, and sometimes from the Inflammation that attends the *Prepuce* from some preceding Cancer or Tumor. The *Yard* is so much blown up, that it forms three or four small Bags one after the other, which proceed partly from the Obstruction, and partly from the Reflux of Blood and

Spirits from the *Penis*. The Signs of the *Paraphymosis* are, a Swelling of the *Penis*, and the Bags upon the *Prepuce*. We commonly observe a Tumor at the End of the *Prepuce*, which is full of a reddish Water. This Tumor will encrease so very large, that if it be not scarified to discharge the Tumor, the Part is in Danger of a Mortification.

The *Franum* or Cordee upon the *Yard* proceeds oftentimes from a Convulsion, or a Tumor, or some acrid and viscous Humour lodg'd in the *Urethra*, where it fixes, because the Ligament of the *Penis* is shorten'd, the Gland contracts it self, and the *Yard* bends or grows crooked. In short, the *Penis*, when erected, pulls down the Gland so forcibly, that it gives exquisite Pain, by endeavouring to extend or stretch the Nerves that were before contracted. If by some Convulsion the *Yard* remains crooked, this Indisposition may hinder Generation. If this Crookedness is from the Birth, it is incurable.

The *Priapism* is an involuntary Erection of the *Yard*, where it remains stiff, without contracting at Pleasure; which arises from the abounding of Blood or Spirits. This Indisposition happens sometimes in the *Hernia*, in the Cholick, Epilepsy or Falling Sickness. The *Priapism* is difficult to cure, because it is always occasioned by a convulsive Motion. The Disease frequently changes into a *Vertigo*, *Apoplexy*, or some other Mortal Malady.

The Want of Erection and Power of Coition, commonly called Frigidity, proceeds from three Causes, according to *Etmuller*. The first is from the Erectors of the Muscles being paralytick, or some other Ways affected, so as to hinder their Contraction; which frequently comes from Bruises upon the Loins, the *Os Sacrum*, or neighbouring Parts. The second Cause is from the Absence or Want of Animal Spirits, which ought to flow into the proper Muscles, and are impeded from Weakness, Contumtion, or some other preternatural Cause. The third is attributed to the Passions, as Excess of Joy, Fear, Bashfulness, &c. which employ the Animal Spirits another Way.

The *Satyriasis* differs from the *Priapism*, because there is always a Desire to satisfy the Passions. It usually proceeds from an Inflammation of the *Penis*, because the nervous Fibres being extended and agitated by the Fermentation of the Fluid, that excites a Motion in the Yard, which gives Pleasure, and disposes the Party to Acts of Venery.

The *Emphyseme* of the *Penis* is occasioned by a thick or gross *Lympha*, which rarefies it self into Vapours. We know it by a Tumor that appears sometimes transparent, and which is often without Pain. This is thick,

and blown up like a Bladder full of Wind. From the Root of the Yard to the End, it is so swelled that one cannot perceive the *Glans*. This is not a dangerous Disease, because it is attended with no ill Symptoms, but is easily cured with Diaphoreticks, and the Application of resolving and emollient Medicines. As to Excrescencies, Ulcers, and Warts, they are very visible, and of no great Difficulty to cure: But what is necessary to be said in relation to the Venereal Disease in all its Parts, we shall leave that to be treated of after we have gone through all the Parts of Generation both in Men and Women.

Of the Organs of Generation in Women.

Hitherto we have followed the Method that the Connexion and Dependence of the Parts upon one another have led us into. But this being a single Subject, and a Specification of the Difference betwixt Sexes, we shall follow the Method of *De Graaf* in it, as the most natural, and the most easy for an Inquirer to follow.

The *Pudendum Muliebre* is divided into Parts *External* and *Internal*: The *External* are those which offer themselves to the View without Dissection, tho' some of them require a Diduction of the *Labia* before they can be seen. These are the *Rima*, *Labia duo*, *Mons Veneris*, *Clitoris*, *Nymphae duae*, the *Exitus* of the *Meatus Urinarius*, and the Orifice of the *Vagina*.

The *Rima* is nothing else but the external Aperture situated below the *Os Pubis*, between it and the *Anus*; and the Space betwixt the *Rima* and the *Anus* is called the *Perinaeum*.

The Skin on each Side of the *Rima* is supported and plump'd up with the *Fat* of the *Membrana Adiposa*, which is here thicker than ordinary, and makes together the *Labia*.

Just above the *Labia*, between the *Inguina*, is the Space which is called the *Pubes*, the middle and most prominent Part of which

has been nam'd *Mons Veneris*, which is a little Protuberance occasioned by the more than ordinary Collection of *Fat* under the Skin in that Place. All these Parts are cover'd with Hair, as most other Parts, where the *Miliary* Glands of the Skin are larger than ordinary, and covered with *Fat*, usually are.

These being absolutely external, are exposed to view without Diduction, and they, as well as the adjacent, have been called by Variety of Names, which either the Wantonness or other Humours of Men have furnish'd them with: But those being of no Service to our present Purpose, we shall omit them, and stick only to the most simple and familiar of them among Anatomists, as Modesty directs us.

In the upper Part of the *Pudendum*, just within the *Labia*, is the *Clitoris*; a Body ordinarily about the Size of the *Uvula* when it is not relax'd: But sometimes, by extraordinary Means, and in extraordinary Cases, it will be extended almost to the Bigness of the *Penis* of a Man, which at all Times it resembles very exactly in its Figure, except that it is not perforated. The extraordinary Size of this Part, and its Propendence sometimes out of the Body in *Infants*, makes the Women mistake such Children for that Sort of Monsters they call *Hermaphrodites*. Of this Sort,

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I had one brought to me upon another Occasion, the *Clitoris* of which hung out of the Body so far, at about three Years old, that it resembled very much a *Penis*; but it wanted the Perforation, and instead of that, just behind it, the Urine issued at a Hole, which was nothing else but a Corner of the *Rima*, the *Clitoris* filling all the rest of the Orifice: So that the Parents mistook it for a Boy, and as such Christen'd it, and as such esteem'd it when it was brought to me. But the Neighbours, who had Notice of this Appearance, call'd it an *Hermaphrodite*.

The *Clitoris* consists of two nervous or spongy Bodies, like those of the *Penis*, which have their Origine from the lower Part of the *Os Pubis* on each Side, which coming together form the Body which is called the *Clitoris*; which, tho' it has no Perforation analagous to that of the *Penis*, yet has a *Septum* or membranous Partition, which runs all along between these two nervous Bodies, from the *Glans* to its Divarication at the *Os Pubis*, where they are called *Crura Clitoridis*, and are near three Times as long as the ordinary Trunk of the *Clitoris* it self.

At the End of it is a *Glans*, resembling in Proportion that of the *Penis*, except, as has been said, the Perforation. This *Glans* is covered with a *Præputium*, form'd out of the inner Membrane of the *Labia*.

The *Clitoris* has a Pair of *Muscles* arising from the *Ossa Coxendicis*, and terminating in its *Crura*, and serving to erect the *Clitoris*. Some Authors ascribe another Pair of *Muscles* coming from the *Sphincter Ani*, which are by others thought only to be the *constrictory Muscles* of the *Vagina*, and assist in hindering the Reflux of the Blood from the *Clitoris*, &c. in Coitu.

It has *Arteries* from the *Pudenda*, and its *Veins* return to the *Hypogastricks*. The *Nerves* come from the *Intercostals*, and run in pretty large Twigs along the Back of it. Hence it is that it appears so extremely affected in the Act of Coition.

After the Blood-Vessels and Nerves have parted with Branches to the *Clitoris*, they are partly spent in a cavernulous Substance, called by De Graaf, *Plexus Reticularis*, that environs the *Pudendum* immediately under the *Nympha*, to which they also send Branches. All these Parts being fill'd with Blood, do

more adequately embrace the *Penis in Coitu*; and by their Intumescence they not only force out the Contents of the *Lacuna*, or excretory Ducts of the *Prostrata*, or *Corpus Glandulosum*, in the Neck of the Bladder, but by excluding the external Air, the *Semen Masculinum* is injected to the *Fundus Uteri*, and *Fallopian Tubes*; and that more especially, if we consider that the *Parietes* of those Parts are furnish'd with a vast Number of Blood-Vessels, especially Veins, and on their Intumescence, that the internal Air must be rarified in those Cavities, by which Means the *Semen Masculinum* passes to the *Ovaria*.

The *Nympha*, or *Ala*, are soft, spongy, red Bodies, descending from the Top of the *Clitoris*, (to which they firmly adhere) to the Sides of the *Meatus Urinarius*, thereby reaching to about the Middle of the Orifice of the *Vagina*, where growing insensibly less and less, they disappear: So that their Length may be accounted, from the *Clitoris* to the middle of the Orifice of the *Vagina*. Their Breadth is very uncertain, but in Maids usually about that of half a Finger. They are sometimes found much larger, and are capable of being distended to a great Degree, so as to hang a good Way out of the Body; and in some, these, as well as the *Clitoris*, have been forced to be cut.

Their Figure, taken together, is a kind of Half-oval. Their Substance is soft and spongy, composed of Membranes and Vessels loosely cohering, and therefore easily distensible.

The Use of them is, by Swelling in the Act of Coition, to embrace the *Penis*, and by their Sensibility to affect the Woman, and mutually to invite to Procreation. They have their Blood-Vessels and Nerves in common with the *Clitoris*.

Just behind the *Nympha* is the Orifice of the *Vagina*, which in Virgins, especially such as have not yet had the *Catamenia*, or but very rarely, is very streight; but in those that have had them oftener it grows larger, but more in married Women, and most in those that have had Children.

Just above the Orifice of the *Vagina*, is the Orifice of the *Urethra*, opening with a little Intumescence. It is externally covered with a whitish Substance, which is partly glandulous and partly membranous, out of which

which issues a glutinous limpid Matter, through certain Ducts, which comes from the inward Part of the *Meatus*, and serves to anoint the Extremity of the *Urethra*.

In the Dissection of these Parts, nothing has more exercis'd the Curiosity of Anatomists than the *Hymen*, who not only differ and contend about the Figure, Substance, Place and Perforations of it, but even about the Existence it self, which some positively affirm, others as flatly deny: And even *De Graaf* himself, the most industrious and accurate Inquirer into these Parts, confesses that he always sought it in vain, tho' in divers Subjects, and in various unsuspected Ages. All that he could find, was a different Straitness, and different Corrugations, which were greater or less, according to the respective Ages: The Younger they were, the *Foramen* being the straiter, and the Rugosities the greater, the former the necessary Consequences of the latter. For as in Time the Parts grew, the Membranes were extended, and so the Surface of them grew gradually more smooth and plain.

Whether it is to be found in all Subjects I dare not affirm, but in those few which I have had Opportunity to examine, I do not remember to have miss'd it in any Subject where I had just Reason to depend upon finding it, if it were constant. The fairest View which I ever had of it, was in a Maid who died at about Thirty Years of Age.

In Infants, it appears to be a fine thin Membrane, not very conspicuous, because of the natural Straitness of the Passage it self, and of the *Foramen*, which, tho' very small, did not allow of any great Expansion in so little Room, and consequently might appear to *De Graaf* a Corrugation only of the inner Membrane. But in this Subject we found it to be a Membrane of some Strength, furnish'd with carious Fibres, in Figure round, and perforated in the Middle with a small Hole, capable of admitting the End of a Woman's little Finger, situate a little above the Orifice of the *Meatus Urinarius*, at the Entrance of the *Vagina*.

It is probable that this Membrane, as most others do, grows more distinct, as well as firm, by Age: And that it is sometimes very strong and impervious, may be collected from the History of a Case reported by that

skillful Anatomist Mr. *Comper*, in his *Explications* of the Fifty first Table of *Bidloo's Anatomy*. I was called (says he) to a married Woman of above Twenty Years of Age, whose lower Belly was distended as if with Child. Upon examining the Pudendum, we found the *Hymen* altogether impervious, and driven out beyond the *Labia Pudendi*, in such Manner, that at first Sight it appeared not unlike a Prolapsus Uteri. In the upper Part, towards the *Clitoris*, we found the Orifice of the *Meatus Urinarius* very open, and its Sides extruded, not unlike the Anus or Cloaca of a Cock, and without any Difficulty I could put my fore Finger into the Bladder of Urine. On dividing the *Hymen*, at least a Gallon of grumous Blood, of divers Colours and Consistencies, came from her, which was the retain'd Menstrua. The next Day no less Quantity of the same Matter flow'd, after removing the Pessary which I had put in the Day before. After three or four Days she was easy, and soon after recovered, and within a Year was delivered of a healthful Child. Her Husband told us, tho' lying with her at first was very painful to himself as well as her, yet at last he had a more easy Access, which could be no other Way than by the *Meatus Urinarius*.

This History proves, that this Membrane is not only a strong Membrane, which could make Resistance to that Force, which overcame the *Meatus Urinarius*, and *Sphincter* of the Bladder which is considerably strong; but by admitting of so great a Dilatation, as to hang extra *Pudendum*, shews that the Structure of it is fibrous, and consequently capable of great Distentions.

Whether this Membrane be always to be found in unvitiated Subjects, is more than I can pretend to determine. The Scarcity of them in Adult, will not let me presume to decide upon my own Observation, and much less can I do it upon any Agreement of Authors, among whom I find some, who are most accurate, doubtful about its Existence.

Adjoining, or rather in the Place of this *Hymen* in Adults, in whom it is not found, are four little Caruncles, or Fleishy Knots, about the Bigness of *Myrtle Berries*, from whence they are called *Myrtiformes*, which some suppose to be largest in Maids, and by Degrees to grow less through the Use of *Veneri*: Others, with more Probability, in my

Opi-

Opinion, derive them from the broken Membrane of the *Hymen*, whose Fragments thrunk up they take them to be. Which of these is in the Right, I am not able positively to say, having yet never seen them, where the Use of *Vener*y had not preceded.

The *Mosaical* Test of *Virginity* has occasioned abundance of Speculation about these Parts, concerning which, the nicest Inquiries can settle nothing certain. Whatever might be depended upon among the *Jews*, in these Countries there may not be the same Reason to expect those *Tokens* of *Virginity*, tho' not at all to be suspected. For, besides that they married extremely young, as it is the Custom of all *Eastern* Countries so to do, (whether a *Hymen* be constantly to be expected or not) there are many Circumstances which may disappoint such Expectations, even in Virgins not vitiated by any Male Contact, or Wantonness of their own. For, whatever may be the Case of those Countries, in these Northern Climates, the Inclemency of the Air exposes them to such Checks of Perspiration, as give a great Turn to the Course of the Humours, and drives so much Humidity through those Parts, as may extraordinarily supple and relax those Membranes from which the Resistance is expected, and from which, in hotter Countries, it might more reasonably have been depended upon. Not but that those Marks are ordinarily found here, but in some that have liv'd long Virgins, or are of very delicate Constitutions, the long Course, or extraordinary Turn of Humours that Way, may render Men unjustly suspicious, where no real Occasion is given. For in some, who preserve their Virginities a great while, and in others, whom a delicate Constitution exposes to a long or great Course of Humours through those Parts, such a Relaxation may be occasioned, as may deceive and offend those Men who expect certain Marks of *Virginity*, especially where a *Hymen* is wanting, which (for any Thing that appears to me) may be mis'd oftner than it is found.

But even supposing a *Hymen* whole and unbroken, that, and the Membranes of the *Vagina*, may be so relax'd, through a long and great Course of the *Catamenia*, or from the morbid Dripping of the *Fluor Albus*, that the purest Virgin may not be able to an-

swer here Mens Expectations from the *Mosaical* Test, whatever might be just in those hot Countries.

All that is certain in this Case, is, that they who have plainly the *Mosaical* Signs of *Virginity*, cannot be suspected; the others may, tho' perhaps unjustly. There are other Accidents that may disappoint these Expectations of *Virginity*, without any Trespas on the Womans Part, which, without a History of the Diseases of those Parts, (which it is not our Intention to give here) it is improper to enumerate.

The *Meatus Urinarius* in Women is very short: It is lin'd internally with a very thin Membrane, and next to that is a Coat of a white Substance, of which an Account is given in the Description of the Orifice. Through this Coat, from some *Lacune* in it, those Ducts pass which convey the Liquor spoken of before in the Account of the Orifice. It is very dilatable, as the Practice of Extraction of Stones, (of extraordinary Size) without Cutting, proves; as well as the History before recited under the *Hymen*.

The *Vagita* of the *Uterus* is a membranous Part, reaching from the *Rima* just above the *Labia*, to the Neck of the *Uterus*. It lies upon the *Intestinum Rectum*, to which it firmly adheres, and under the *Vesica Urinaria*. It is reckon'd to be seven or eight Inches long.

The inward Substance of it is nervous, and exquisitely sensible: The outward membranous, and of a loose Texture, with carnosous Fibres running longitudinally upon it.

At the Orifice it is much narrower than elsewhere, particularly in Virgins, especially very young ones. Thro' the whole Course of it, it appears to be wrinkled, especially on the upper internal Surface. The Use of *Vener*y renders these *Ruge* less apparent, and frequent *Parturition* almost obliterates them; which shews that they were contriv'd to render the Part more easily distensible for *Parturition*.

Along the whole Tract of the *Vagina*, there are a great many Pores, or *Ostia*, or little Ducts, to be seen, which, in Acts of *Vener*y, emit a Liquor that has been by many mistaken for *Seed*, and are found in
greatest

greatest Plenty about the lower Part of it, especially about the *Exitus* of the *Meatus Urinarius*.

The *Vagina* has likewise a *Constrictory* Muscle inserted under the *Clitoris*, which, with a broad Series of Fibres, embraces and constricts the lower Part of the *Vagina*, spoken of before.

The *Uterus*, or *Matrix*, is situated in the *Pelvis* of the *Hypogastrium*, between the *Intestinum Rectum* and the *Urinary Bladder*. It is surrounded and defended by mighty Bones, before by the *Ossa Pubis*, behind by the *Os Sacrum*, on each Side by the *Os Ilium* and *Iscium*. It is in Figure something like a flat Flask, or a dried Pear. In Women that are with Child, it receives different Forms, according to the different Times and Circumstances of *Gestation*.

In Maids, and Old Women long past their *Menses*, it is pretty near of a Size. It is divided by Anatomists, as all other Cavities of this Kind are, into the *Fundus* and *Cervix*; a broad Part, and a Neck: And is in Extent, from the Extremity of one to that of the other, about three Inches in Length. Its Breadth at the *Fundus* is about two and a half, and its Thickness two.

It has but one Cavity, unless we make a Distinction between the Cavity of the *Uterus*, and that of its *Cervix* or Neck. That of the *Fundus* is very small, scarce sufficient to contain a Garden-Bean. At the Bottom, or Neck, it grows excessive narrow in Virgins, unless at the Time of Purgation, scarce wide enough to admit a *Crow's Quill*: The Extremity of which Passage, is called the *Osculum internum*. In pregnant Women it opens, more especially towards the Time of Delivery. But to obviate the Inconveniences that might happen by the Womb's remaining open, it is, as it were, sealed up with a Sort of glutinous Matter, that issues from the Glands about it.

The lower Orifice of the Neck, looking towards the *Vagina*, is a little prominent, and resembles, in some Measure, the *Glans* of the *Virile Organ*. The Substance of it appears to be very firm and compact, yet is nevertheless dilatable to a great Degree, as appears by the Exclusion of a full grown *Fœtus*.

The Substance of the *Uterus* is membranous

and carnosus. It consists of three *Tunics*, or according to some, who deny that Name to the middle Substance, of two only.

The *External Tunic*, which is called the *Communis*, is derived from the *Peritonæum*. This consists of two *Lamellæ*, and is pretty thick and strong. The exterior of these is smooth, the interior somewhat rugged and uneven, through the Connexion of the adjacent Parts. This Membrane invests the whole Womb, and connects it to the *Intestinum Rectum*, Bladder of Urine, and other adjacent Parts.

The *Middle Tunic* is very thick, and is composed of thick strong Fibres variously disposed. It seems to be muscular, and is by some thought to contribute to the Exclusion of the *Fœtus*, and other Contents of the Womb: Though, in my Opinion, that is not the Office of it, and this, as the muscular Membranes of other Parts, serves only to recover the Tone after any violent Distention.

The *Inner Tunic* is nervous. It is thin, and in the *Fundus Uteri* smooth, but in and about the Neck very much wrinkled, and pierc'd with Abundance of little Holes, like the Mouths of Ducts, out of which, upon pressing, issues a clear, ropy Liquor, which probably is that which seals up the Mouth of the Womb in the Time of *Gestation*.

The *Uterus* is connected by its Neck to the *Vagina*, behind by its outward common Membrane, and before by the same to the *Vesica Urinaria*. Its Sides are tied to other Parts, but the *Fundus* of it is left loose, that it may expand and dilate with more Freedom, according to particular Exigencies.

The *Ligaments* are in Number four, two of them called the *Broad Ligaments*, and two *Round*, from their Figure.

The *Broad Ligaments* are membranous, and arise from the *Processus* of the *Peritonæum*, from which they branch off about the Loins, and are fasten'd to the Sides of the *Uterus* and *Vagina*, and serve to prevent their falling down. They contribute likewise towards the sustaining the *Ovaria*, the *Tubæ Fallopianæ*, and other Vessels, which they as it were embrace.

The *Round Ligaments* arise from the Sides of the Womb, at the Place where the *Tuba Fallopiana* are join'd to it. At their first Rise they likewise are broad, but by Degrees, as they recede farther from the Womb, they grow round and smooth. And as the *Spermatick Vessels* do in Men pass betwixt the Duplication of the *Peritoneum*, and so out of the *Abdomen* through the *Foramina* of the oblique and transverse Muscles of the *Abdomen*, then running obliquely upon the *Os Pubis*, they there terminate under the Fat near the *Clitoris*. By the Passages of these Ligaments, Women and Girls especially are expos'd to inguinal Ruptures, as Men are by the Passages of the *Spermatick Vessels*.

The Substance of the *Broad Ligaments* is membranous, loose and soft, whence they have been compared by some to the Wings of *Bats*, and call'd *Ala Vesperilionum*; and from the Intertexture of some Fibres, others have mistakenly fancied them to be *Muscles*. After hard Labour, and a forc'd Delivery, these Ligaments are sometimes over-strain'd so far, as not to recover their Tone, whence follows a Propendence at the *Pudendum*, which is term'd *Prolapsus Uteri*. But whether properly so called, and that Appearance be a real *Prolapsus* of the *Uterus*, or only a Dilatation and Propendence of the *Vagina* only, as some would have it, is an Enquiry not of this Place.

The *Round Ligaments* are of a firmer Texture, and consist of a double Membrane, wrapping up in it *Arteries*, *Veins*, *Nerves* and *Lymphaducts*, intermix'd with fleshy Fibres, whence some have mistaken these also for Muscles. The *Blood-Vessels* and *Nerves*, both in these and the *Broad Ligaments*, are numerous, and make up a great Part of what is call'd their Substance. These, as the others, serve to keep the Womb in its right Position, and are capable of being injured, by the Violence of Unskilful Midwives, in hasty forc'd Deliveries.

By these Ligaments the *Uterus* is kept so tight in its proper Situation, that no Violence of internal *Flatus* or Humors can raise it above its Place. For as *De Graef* observes, a Man pulling with both Hands, with all his

Strength, cannot raise it above the *Os Sacrum*. This makes appear the Vanity of that Opinion which some have maintain'd after the great *Hippocrates*; that in *Hysterick Passions*, as they are improperly call'd, the *Uterus* rises, and pressing on the *Stomach* and *Diaphragm*, causes that Sense of *Suffocation* which Women feel in such Affections: An Error pardonable in the Times of that great Philosopher, when Anatomy was but rude, but not to be forgiven in Modern Physicians, who have the Means of knowing, at the Expence of others Labour, (if they would take the Pains to read) the Absurdity and Impossibility of that Notion.

On each Side of the *Fundus* of the Womb arises a *Duct*, which opens into the Womb with a very small Orifice, scarce admitting a small Stile, or a Knitting-Needle, but in its Progress its Capacity grows greater, being large enough to admit the End of a Man's little Finger, and towards the End is contracted, and grows small again. At the End next the *Ovaria*, which is at Liberty, it is again expanded into a Sort of *Foliage*, which is fringed round with innumerable little Fibres, like a ragged Fringe, which Expansion, when opened, was thought, by *Fallopins* the first Describer, to resemble the End of a Trumpet, and therefore the whole Duct was by him nam'd *Tuba*.

It consists of a double *Membrane*, the outward smooth and even, deriv'd from the common Membrane of the *Uterus*. The inner, which springs from the inner Membrane of the Womb, is very much corrugated, more especially at the Extremities. That farthest from the Womb at the Time of Impregnation, at which Time the whole *Tube* is expanded, reaches to and embraces the *Ovary*: Another Times it seems to fall a little short of it, and is only slightly tied by a thin Membrane, reaching from the under Part of the *Expansum Foliacum* to the under Side of the *Ovary*. These *Tubes* are about five or six Fingers Breadth long.

Both *Arteries* and *Veins* are very numerous here, especially the latter, which by their Ramifications and Contortions make the main Substance of them, which is a Kind of *Reticular* or *Cavernous* Body, consisting

sisting almost wholly of Blood-Vessels, not unlike that of the *Pudendum*, or *Clitoris*, before describ'd. This Structure makes it capable of Dilatation and Contraction, according to the Quantity and Stop of the irruent Blood, and consequently of being erected (if I may use that Term) in *Coitu*, and of embracing the *Ovarium* at that Time, which in its State of Flaccidity it did not reach.

Doctor Wharton has ascrib'd *Valves* to them, and others have divided them into *Cells*; but tho' both are to be found in the *Cornua Uteri* of some Brutes, they are not to be met with in the *Tubes* of Women, which have but one Cavity a little dilated in the Middle, and no *Valves*.

Near the Ends of these *Tubes*, about two Fingers Distance from the *Uterus*, lie the *Ovaries*, or *Testes Muliebres*, so called from their Use, which was formerly supposed to be analogous to that of the Testicles in Men.

They are connected to the Womb by a strong Ligament, called by many Anatomists *Vas Deferens*, upon Supposition that it was a Vessel which convey'd the Seed to the Womb, and in some Measure likewise by the *Tubæ Fallopiæ*, and by the Broad Ligament. About the Region of the *Os Illium*, they are fasten'd to the *Peritoneum* by Means of the Spermatick Vessels, and the Membranes which cover them, by all which the *Ovaries* are kept suspended about the same Height with the *Fundus Uteri* in Women not pregnant. In Pregnants they rise along with the *Uterus*, but not quite so high as that does in the last Months of Gestation.

Their Figure is not so round as the Male *Testes*, but is a Kind of Semi-oval, gibbous on one Side, and depress'd on the other, with a Superficies something uneven, through the unequal Protuberance of the *Ova* which they contain.

They are of different *Magnitudes* in the different Stages of Life. At the Time of *Pu-berty*, when they are at their largest, they weigh ordinarily about a Dram and an half, and are about half the Bigness of a Man's Testicle. In the Flower of Age they are plump and succulent, but as Age comes

on, they wither and shrink by Degrees, and grow hard and dry, so as sometimes at last to weigh not above a Scruple. Some Anatomists have affirm'd, that these, as glandulous Parts, like the *Thymus*, were bigger in Infants, and decrease gradually after Birth; but De Graef, who weigh'd many of those of new-born Children, says, he never found them weigh otherwise than between five and ten Grains.

They are covered externally with a common *Membrane* from the *Peritoneum*, to which some add a proper *Membrane*.

The *Membrane* being taken away, the *Substance* appears whitish, composed of a Multitude of thin little Membranes, and slender Fibres, interwoven with a great Number of *Arteries*, *Veins* and *Nerves*.

Among these Fibres, Membranes and Vessels, are found interspers'd a Number of little round Bodies, like Bladders, full of a limpid Substance like the White of an Egg, which boil'd acquire the same Colour, Taste, and Consistence, with a boil'd White of an Egg, from which Similitude, as well as from the Analogy of their Use, (being taken for the material Principle of Generation) they are now commonly called *Ova* or Eggs, and the *Testes* in which they are contain'd *Ovaries*.

These Eggs are of very different *Magnitudes* in the same *Ovary*, though the biggest in a Woman seldom equals the Size of a White Pea. They are so numerous, that De Graef has told above twenty in one *Ovary*. These Eggs have been found by Anatomists in the *Ovaries* of almost all Sorts of Animals, and are not doubted to exist in the Females of all Sorts of Animals whatsoever.

Besides these Eggs, there are sometimes found another Sort of watry Bladders, which are suppos'd to be preternaturally in that Situation, because they are found but now and then, and sometimes even bigger than the Eggs themselves. These are called *Hydatides*, and are probably the first Beginning of a *Dropsy*, commenc'd in this Part by the Eggs, and perhaps are no other than the *Hydropical Eggs* themselves.

It is not unlikely, that all those *Dropsies* of the Belly which Women labour with under the fallacious Name of *Tympanies*, have their first Rise in these Parts. I have been present at the opening of several, and have always found the *Ovaria* distended with Water to an incredible Magnitude (though not always equally on either Side) but especially in one, when a Gallon or more of Water was taken out of one *Testicle*, and the Membranes of the *Testicles*, after the Water was taken out, so enlarg'd and thicken'd, that it appeared by Hand to weigh some Pounds, but not having weigh'd it in *Scales*, we cannot tell the exact Weight of it.

The *Blood-Vessels* that go to the *Uterus*, and the appending Parts, are divided into Superior and Inferior. The *Superior* are the same that are call'd in Men the *Spermatica*, and *Vasa Preparatoria*, and have their *Origines* from, and *Exit* into, the *Aorta* and *Cava*, as the Vessels of Men have; but not being sent out of the *Abdomen*, their Course is shorter. The Branches which they distribute into the *Uterus* and *Vagina*, are larger, and more in Number, than those that go to the *Tuba Fallopanæ* and *Ovaria*.

The *Inferior* are Branches of the *Hypogastricks* and *Hæmorrhoidals*, and onlyicat-

ter themselves upon the lower Part of the *Vagina*. Those before-mentioned are pretty large, and are distributed all over the *Vagina* and *Uterus*, running after an irregular Manner with abundance of Contortions, and joining very apparently by perfect *Anastomoses*, *Arteries* with *Arteries*, and *Veins* with *Veins*, as blowing into them, or Injections with any Liquor shew, especially the Injections of Wax.

But in the Times of Gestation these Vessels grow very large, and plainly shew, even without Injection, their Communication; some of them being large enough to admit of a Swan's Quill.

They receive *Nerves* from the *Par Vagum*, and from the *Cauda Equina* in the *Os Sacrum*.

Monsieur Nuck has given us an accurate Description of the *Lymphaducts* of the *Ovaria*, in his *Adenographia Curiosa & Uteri Fæminei Anatome Nova*: They arise from the Surface of the *Ovaria* by several Branches, which unite and make three Branches on each Side, and partly empty themselves into the *Lymphatick Glands* below the *Emulgent Vessels*, whence other exporting *Lymphaducts* arise, and empty themselves into the *Receptaculum Chyli*: Others empty themselves immediately into the *Receptaculum*.

Of the Placenta Uterina, the Umbilical Vessels, the Membranes that involve the Foetus, and the Liquors that they contain; the Situation of the Foetus in the Womb, the Legitimate Time, the Nourishment of the Foetus, the Difference between a Foetus before Birth and after.

AFTER Impregnation, there is a new Production of Parts, that exist only during the Time of Gestation, and afterwards are either discharged, or dry up and disappear.

Of these, the *Principal* is the *Fetus*, for the Sake and Use of which all the rest are form'd. But of that more hereafter.

After the *Fetus*, the most considerable for Bulk and Figure is the *Placenta*, by ancient Anatomists called *Hepar Uterinum*, for Reasons which, since the Discovery of the Circulation of the Blood, are out of Date. It is something in Figure like a Plate without Brims, about three quarters of a Foot over, sometimes a Foot. It is round generally, of a Figure *Concave Convex*. The Concave Side adheres to the *Uterus*, and is uneven, with divers Protuberances and Pits, by which it made Impressions on, and received 'em from the *Uterus*. The Place of it in the *Uterus*, whatever some pretend, is not certain.

In *Women*, unless in case of *Twins*, or more, there is but one: However the Number generally answers the Number of the *Fetus*. In some *Brutes*, especially in *Oxen* or *Sheep*, they are very numerous, sometimes near an Hundred, even for one *Fetus*, small, and resemble pretty large conglomerate Glands.

From the external or concave Side, which likewise has its Protuberances, though covered with a smooth Membrane, issue the *Umbilical Vessels*, which are in great Plenty distributed through the whole Substance of it.

The *Umbilical Vessels* are, two *Arteries*, a *Vein*, and the *Urachus*.

The *Arteries* arise from the *Iliacs*, generally near their Division into External and Internal, and thence pass on each Side of the *Urinary Bladder*, through the *Navel*, to the *Placenta*.

The *Umbilical Vein*, from innumerable Capillars united into one Trunk, descends from the *Placenta* to the Liver of the *Fetus*, where it is partly distributed into the *Porta*, and partly into the *Cava*. The Trunk of this *Vein*, answerable to the Occasion, is above double the Capacity of either *Artery*. It is sometimes divided before it comes at the *Fetus* into two Branches, and united again within.

The *Arteries* have in several Places Contortions or Convolutions, which form a Sort of Knots, by the Number of which our *Midwives* superstitiously reckon the Number of Children the Woman is to have.

Among these *Umbilical Vessels* may be reckon'd the *Urachus*, which, tho' not plainly found, except in *Brutes*, where it is indisputable, is in my Opinion however reasonably to be allow'd, though our Opportunities of Examination not being the same, it usually collapses, and grows so stiff before such Subjects come under our Examination, that we have not a fair Trial: But the Necessity appearing to be the same, I can little more doubt the Existence of it, than in *Brutes*, where it is exhibited beyond Contradiction.

To these Vessels are continued the *Membranes* which include the *Fœtus*, the interior of which including the *Fœtus*, and the Liquor wherein it lies, is called *Amnios*, which is a white, soft, thin, transparent Membrane, containing in it a limpid Liquor, like a thin Gelly Broth; of which the Stomach of the *Fœtus* being always found full, it is probably, in Part at least, the Matter of its Nourishment.

On the out Side of this is found a thin Humour, that in Consistence and other Circumstances resembles Urine, which, according to Dr. Needham, is contain'd in a proper Membrane, which he calls *Membrana Urinaria*, and receives the Discharge of that Liquor from the *Urachus*. But Subjects proper for an Examination of this particular being rare, Anatomists have doubted the Existence of this Membrane, and have chosen rather to make it a Duplicature only of the *Chorion*, and to leave the Liquor which it contains (which is no small Quantity) unaccounted for; than to allow any Thing analogous to the *Allantois* in Cows and Sheep, though the Necessity appears to be the same. For this they give no other Reason, than that the *Urachus* of a Humane *Fœtus* is not permieable by the *Flatus*, and that the Membrane, which Dr. Needham calls *Urinaria*, adheres in some Places pretty closely to the *Chorion*. The first of which may happen generally, because such Subjects are not exposed Time enough to them to make a fair Inquiry. The latter carries no Weight at all with it.

The outward Membrane of the *Chorion* is a pretty thick, strong, whitish Membrane, cover'd with a Multitude of Branches of Veins and Arteries. It is divisible into two *Lamella*, whereof the outermost is thick and opaque, the inner thin and transparent. Those that deny the *Urinary Membrane*, divide it into three, the innermost of which is as the outer, likewise pretty thick, contrary to the common Course of Nature, which is some Argument for its being a distinct Membrane.

Some Anatomists have pretended to give an Account of the Posture of the *Fœtus* in the Womb at the several Times of Gestation. But these are so very various and uncertain, that such Accounts are little to be

depended upon. In the first Months, it is of no Moment how it lies in the Womb. In the latter Months, after the *Fœtus* is grown not only quick, but robust, it frequently changes its Postures of it self, as not only the Mothers themselves feel, but any Body, by laying their Hands upon their Bellies, frequently may. However, their ordinary Posture is accounted to be Sitting, with the Head uppermost, the Knees brought up between the Elbows, the Feet drawn back towards the Buttocks, the Hands closed below the Knees, and the Head dropping, with the Nose, as it were, between the Knees.

When the Time of Birth draws very near, it generally turns it self, and, preserving as to the rest near the same Posture, presents the Head to the *Os Uteri*, which is the most easy and natural Posture for Delivery. When the *Midwives* find it thus offering, they say it lies right. Sometimes it presents the Feet first, and this Way Women are delivered, but with great Difficulty and Pain. Sometimes likewise it lies a-crofs, offering either a Hand, a Foot, a Knee, or an Elbow; and this Way Delivery is impracticable; and unless the *Midwife* has the Address and Skill to turn it, as they boast that they do sometimes, either Mother or Child, or both, must be lost. In this deplorable Case, the Life of the Mother is generally prefer'd to that of the Child, and the Child, by Means of Instruments, has been brought away by Piece-meal.

Sometimes the Child dies in the Womb, which if not timely discover'd, and brought away, the Mother runs great Hazard. This Sort of Births is not inconsistent with the Safety of the Mother. *Bartholin*, in a Book *De Insolitis Partus Viis*, relates a great many suspitious Cases of Children dead and putrified in the Womb, the Parts of which have made their Way through *Apostemations*, one whereof at the Navel was some Years in coming away, some Bones being discharged at long distant Times, and making up in all, as he judges, sufficient for the Skeleton of Twins.

Something like this happen'd to a Gentlewoman of my Acquaintance, who receiving a great Fright after she was twenty Weeks gone with Twins, found her Belly insensibly to

to begin to sink on one Side, and at length to grow very cold, flaccid, and flat, whilst the other Side continued to swell and increase till the due Time of Delivery, when she was delivered of a live Child. With it came away abundance of foetid, putrified, black and other coloured Matter, mix'd with the Bones of a Child, which died at the Time of that Fright, and remain'd corrupting in the Womb till the Time of Delivery. The *Placenta* of the Child which was born alive was very black, discoloured, and in some Measure putrefied likewise. The Child however grew up to be a Woman, and is now alive and bears Children, but has been from her Cradle obnoxious to *Scrofulous Tumors*, *Ulcerations*, *Cutaneous Eruptions*, and *Swellings*. It is probable the Infirmitly to which this *Gentlewoman* is obnoxious, is owing to a Taint received from that unhappy *Bedfellow* in the Womb.

It happens sometimes likewise that the Mother dies, the Child yet living and vigorous in the Womb. In this Case, without Scruple or Delay, the Womb is to be cut open, by which Means the Life of many Children has been saved, and some not yet come to Maturity for a *Natural Birth*. This Way our *Edward the Sixth* was brought into the World, and *Julius Caesar*, from whom it has been ever since called *Partus Caesareus*.

The *Legitimate Time* of the Birth has been much controverted, though common Observation shews it to be about Forty Weeks from the Time of *Impregnation*; and though very frequent Instances of those that go longer, or come sooner, are pretended, yet I believe this to proceed rather from the mistaken Accounts of the Women themselves, than from any Variation in Nature. We do indeed not only read of, but frequently see, Births of *Seven* and *Eight* Months, but these may be reckon'd among the untimely *Deliveries*, and the Child is seldom or never Mature, if there has been no Fallacy in the Reckoning. All Creatures have a stated Period for bringing their Young into the World at Maturity, and why it should be otherwise in Women, no Reason appears.

How the *Fetus* is nourish'd in the Womb, has been a Question as much agitated among

Anatomists as any whatsoever. Some contend that it is nourish'd by the Mouth, others will have it to receive its Increase, and to grow like a *Vegetable* from the Mother, as from the Root, of which the *Umbilical Vessels* are the Stem, and the Child the Head, or Fruit of this *Plant-Animal*, if I may use that Expression. But this Question, and some others, we shall wave here, as containing something of curious Argument, and deserving a more particular Discussion.

There are some Differences in the *Structure*, *Mechanism* and *Proportion* of the Parts of a *Fetus*, from those of an *Adult*, of which the Principal are those about the *Umbilical Vessels* and *Liver*, and those about the *Heart* and *Lungs*. The most apparent of these, is the *Funiculus Umbilicalis*, which is a Part that at the Birth is either broken, or cut away to the *Navel*. Here are two *Arteries*, and a *Vein* and *Urachus*, which, after Birth, become perfectly useless as Vessels, and drying, become impervious, and serve only as *Ligaments* to suspend the *Liver*.

In the *Liver* it self is the *Canalis Venosus*, which in a *Fetus* maintains a Communication between the *Porta* and *Cava*, but after Birth dries up by Degrees.

In and at the *Heart*, are the *Foramen Ovale* and *Canalis Arteriosus*, both which serve to maintain the Circulation of the Blood, and to divert it from the Lungs, which in a *Fetus* are idle and useless, and of a darker Colour, and closer Consistence, than after they have been breath'd into, as appears by their swimming in Water after Birth, which they will not before do. This Difference in the Lungs affords an useful Experiment, in case of the suspected *Murder of Children*, for if they were *Still-born*, the Lungs sink in Water; if born alive, they swim. The afore-nam'd Channels serve only for the Use of a *Fetus*, to prevent that Obstruction the Blood would otherwise have within the Lungs before they have been open'd. After Breathing has open'd the Lungs, the Blood takes its Course through them, and these Passages close up.

The *Head* is much bigger in Proportion to the rest of the Body than afterwards; the Bones are softer, and the Sutures unclosed, leaving a great Space on the Top of the Head, covered only with the Membrane, which

which is afterwards closed up with the Bones.

The *Thymus* and *Glandula Renales* are considerably larger than afterwards, for it does not increase in Proportion to the Age of the Person.

Most other Glands are likewise bigger and softer, as the Brain it self is.

There are other Differences which are of no great Moment, and therefore not necessary to be mentioned here.

Of the Catamenia, or Menfes.

THE Periodical Purgations of Women not with Child, or giving Suck, is a *Phænomenon* that has exercis'd the greatest Wits of the Faculty, who, after many learned Arguments, and many ingenious *Hypotheses*, have not been able to come to any Agreement among themselves.

All Authors agree, that the Necessity that Women have for some extraordinary Supply, to recompence the Expence, and to support them under it, during the Time of *Gestation*, was the final Reason why this Redundance at other Times was given to them.

But this is the only Point wherein they are generally agreed. Some not content with that Occasion alone, will have the Menstruous Blood to offend in *Quality*, more than *Quantity*, which they argue from the Pain it gives many Women in the Evacuation. They say likewise, that the Malignity of them is so great, that they excoriate the Parts of Men by the meer Contact; that the Breath of a Menstruous Woman will give a permanent Stain to Ivory, or a Looking-glass; that a little of this Blood drop'd upon a Vine, or Corn, or any other Vegetable, they become sterill or blasted; that if a Woman with Child be defil'd with the *Menfes* of another Woman, she miscarries; that if a Dog tastes them, he runs mad; if a Man, he becomes epileptick; which, with abundance of other such Fables, though recounted by many grave, and some great Authors, I reject, as needing no Refutation, and have only recited them, to shew what Things have been superstitiously taken up upon Credit, without sufficient Examination, by Men of great Authority, who have been

prevailed upon to believe, what the Women at all Times would laugh at. Another Thing likewise, which we shall not bestow much Time upon, is, the supposed Dominion of the Moon over the Bodies of Women in this Case, a Fancy which antiently was the universal Opinion, though common Experience, with a very little Reflection, might have shewn the Weakness of it. For if this Purgation had been caused by any Influence of the Moon, then all Women of the same Age and Temperament should be purg'd according to the same *Periods* and *Revolutions* of the Moon at the same Time, which daily Experience shews to be false.

There are two Opinions however, that are argued with a great deal of Strength and Reason, both which allow the Quality of the Blood to be innocent, but they differ about the Reason of its Issue. Doctor *Bohn*, and of late Dr. *Friend*, a learned ingenious Gentleman of *Oxford*, maintain that this *Flux* is the Result of a meer *Plethora*, and to be evacuated only for Relief against the Quantity.

Others are of Opinion, that this Evacuation is owing to a *Fermentation* rais'd at that Time, and that the Eruption of the Blood in those Parts is the Effect of an Effervescence or Ebullition of the Blood. This Opinion has been maintain'd by many, but its chief Supporters are, the learned Doctor *Charleton* here, the ingenious Doctor *Bayle*, Professor of *Physick* at *Tholouse*, and Doctor *De Graef*, whom we have had so frequent Occasion to mention.

The two first of these suppose a *Ferment* peculiar to the Women, which produces this *Flux*,

Flux, and affects that Part only, or at least principally. *De Graef*, less particular in his Notion, only supposes an Effervescence of the Blood rais'd by some Ferment, without assigning how it acts, or what it is.

Dr. Friend (who has sustain'd the Cause of a *Plethora* with the greatest Clearness and Strength) supposes that this *Plethora* arises from a *Coacervation* in the Blood-Vessels of a *Superfluity* of Aliment, which he thinks to remain over and above what is excreted by the ordinary Ways; and that Women have this *Plethora*, and not Men, because their Bodies are more humid, and their Vessels, especially the Extremities of them, more slender, and their Manner of living generally more unactive than a Man's, and that these Things concurring, are the Occasion that Women do not perspire sufficiently to carry off the superfluous Alimentary Parts, and that therefore this Overplus must be retain'd in the Vessels, till it be accumulated in such Quantity, as to distend the Vessels, and force its Way through the *Capillary Arteries* of the *Uterus*. And he thinks this Discharge to happen in that Part, rather than in any other, because it is more favoured by the Structure of the Vessels, the Arteries being very numerous, and the Veins very sinuous and winding, and therefore more apt to retard the *Impetus* of the Blood, and consequently, in a *Plethorick* Case, to occasion a Rupture of the Extremities of the Vessels, which may last till by a sufficient Discharge the Vessels are eas'd of their Overload.

This I take to be the Substance of that learned, ingenious Gentleman's Hypothesis, from whence he very Mechanically, and very Philosophically, deduces a *Rationale* of the Symptoms.

To this Hypothesis I could subscribe, did not many Observations convince me, that there is no such *Plethora*, or at least that it is not necessary to *Menstruation*; for if the *Menses* were owing to a *Plethora* so accumulated, the Symptoms would arise gradually, and the Heaviness, Stiffness and Inactivity, (necessary Symptoms of a *Plethora*) would be felt long before the *Absolution* of the *Period*, and Women would begin to be heavy and indisposed soon after their Evacuation, and the Symptoms would encrease Day by Day.

But this is contrary to all Experience, and many Women, who have them regularly and easily, have no Warning, nor other Rule to prevent an indecent Surprise, than the Measure of the Time; in which some that have slipped, though otherwise modest and careful Women, have been put to such Confusions and Shifts, as would not consist with the Notice that a *Plethoric* Body would give.

But even in those who are difficultly this Way purg'd, the Symptoms, tho' very vexatious and tedious, do not make such regular Approaches, as a gradual Accumulation necessarily requires: If we consider what violent Symptoms will come on in a Day, or an Hour, we shall be extremely puzzled to find out the mighty Accession of Matter, that should in an Hour or Day's Time make such great Alterations. According to this Hypothesis, the last Day contributes no more than the first, and consequently the Alteration should be no more sensible, excepting the bare Eruption: But it is neither my Business nor Intention to combat any Man's Opinion. The learned Doctor *Bohn* has said a great deal, and *Dr. Friend* has rendered this Opinion to plausible, that I wish it were true; and must do him this Justice, that his is the first Account of the *Periodical* Revolution of the *Menses* that I have met with Philosophically contriv'd, and like an understanding Inquirer. Most others have either given trifling or precarious Solutions, or pass'd it over as a Difficulty beyond Humane Understanding.

The other Hypothesis, of a Fermentation or Effervescence of the Blood, has had much worse Luck: For either it has been flubber'd over as a Thing whereof the Fact was certain, but the Reason inscrutable, as *De Graef* has left it; or establish'd upon an imaginary Ferment, which never was proved to exist, and perhaps never will be.

The sudden Turgescence of the Blood gave them Reason to think, that it arose from something till then extraneous to the Blood: But where to find that they did not know, and therefore had Recourse to the Parts suppos'd to be principally affected, and feign'd an imaginary Ferment, which no Anatomical Inquiry could ever shew, or affirm any reasonable Receptacle for, nor no Reasoning

necessarily infer: But on the contrary, both *Autopsy*, and Reasonings from it, conclude against it; since neither the fermenting Matter it self, the Organs by which it should be secreted, nor the Place where it should be repositd, are to be found.

However, the *Heat*, which accompanies the *Turgescence* of the Blood, shews that it is not merely *Plethorical*, but that there is an extraordinary intestine Motion at that Time: Which is likewise confirm'd by the Operation of most Medicines conducing to that End, which are most of them such as will give a *Fermentative* Motion to the Blood; or such as will stop an extraordinary Flux of Humours another Way, which is one of the ordinary Causes of a Defect of the *Menses*. For this Reason, *Viriolick* and other *Resfringent Medicines*, which are sometimes given with Success in Obstructions, as they are called, are not strictly to be reckoned among the *Provocants*, but to the Number of those that, by rectifying the Tone of the Stomach and Intestines, stop extraordinary Fluxes that Way, and by Degrees mend and invigorate the Blood, which by such Discharges is impoverish'd.

The Suddenness and Violence of the Effervescence, which is such as to break out at the *Nose*, *Hæmorrhoids*, *Lungs*, *Stomach*, *Eyes*, and indeed almost any Part of the Body, shews, that whatever is the Cause, it is something very active, and that may be introduc'd in Quantity in a short Time into the Blood; and consequently, that it must be ready gathered in some Receptacle, where, while it was contain'd, its Action was prohibited. For, if it had been scatter'd in the Blood it self, it must either have acted constantly and regularly, and then no such *Critical* Evacuation could happen; or it must exert its Power gradually, according to its Increase in the Blood, and so the Symptoms must have approach'd in the same Manner as we have argued against a *Plethora*.

The only Humour which I can find in the Body, so circumstantiated as this *Phænomenon* seems to require, is the *Bile* contain'd in the *Gall-Bladder*. This is a *Liquor* that propably may have divers Uses, and produce many Effects in an Animal Body which are yet unobserved: But universal Experience agrees, that it is capable of raising Disorders,

or *Fermentations extraordinary*, whenever it insinuates it self in Quantity into the Blood. And as it is contain'd in a peculiar Receptacle, which seems not to admit of a constant Issue, it may be there reserv'd, till in a certain Period of Time the *Bladder* becoming turgent and full, through the Compression of the incumbent *Viscera*, it emits the *Gall*, which, by the Way of the *Lacteals*, insinuating it self into the Blood, may raise that *Effervescence*, which occasions the *Aperture* of the *Uterine Arteries*.

All Observations agree, that Persons of a *Bilious* Constitution are either more plentifully, or more frequently purged this Way; and I my self have observ'd divers *Bilious* Persons, who, tho' obnoxious to a *Fluxus alvi*, which kept them far from a *Plethorick* Condition, were however vex'd with a *Menstruous Hypercatharsis*: And it is observable, that Men of *Bilious* Constitutions are more frequently troubled with the *Piles* than others; and that Distempers manifestly *Bilious*, are attended with Symptoms resembling those of Women who labour under difficult *Menstruation*: Their *Pulse* increases, their *Heads* ache, they *Vomit*, they have *Cholical Pains*, and feel a general *Fulness* and *Stiffness*, and are relieved in great Measure by Bleeding from most of these *Symptoms*, which a *Critical Discharge* carries off.

It may be objected, That Men abound with *Bile* as well as Women: But to that Objection I take the Liberty to answer, that they do not, nor with any other Humour that is permanent in the Body, *Semine excepto*. For as in Men the *Pores* of the Body are more open, and carry off more of the *Serous* Part of the Blood, which is the Vehicle of all the other Humours; so consequently, a greater Part of each of them is discharged through them, than in Women, in whom the Superfluity must continue to circulate with the Blood, or be gather'd into proper Receptacles, which is the Case of the *Bile*.

The same Argument which holds, why *Menstruation* should not belong to Men; will hold likewise in Brutes, whose *Pores* are manifestly more open than those of Women, as appears by the Crop of Hair which they bear; for the Vegetation of which a larger Cavity, and a wider Aperture of the

Glands, is necessary, than where no such Thing is to be produc'd. Yet there is a Difference in this Point between the *Males* and *Females*, even in them: These latter have their *Terms*, tho' not so often as Women, nor in the same Form or Quantity, though Blood sometimes be the Result of them.

No Anatomist, that I know of, has yet offer'd a satisfactory Reason, Why a Sort of *Bile*, more thin and acrimonious, should be separated into a Receptacle by it self, and not constantly discharged, as that of the *Portus Biliaris* is. They have generally referred it for the Use of Chylification; but besides, that it appears to be no proper Ingredient of so sweet a Juice as Chyle is, they have but precariously affirm'd it only, and have not given us any necessary, nor to me convincing Arguments, of its *Instrumentality* in that Case; nor indeed can I help saying, that they have brought it without Necessity into an Operation which might be compleat without it.

I think it unnecessary to apply this *Hypothesis* to the several *Phænomena* of the *Menses*, whether in a natural, regular, or a diseased Case. The Solution of particular *Problems*, relating to this Part of the Animal History, flows very readily and naturally from it; and whatever may be urg'd for the Power of a *Plethora*, or of any particular *Ferment*, may be applied without any Straining to this. The only Difficulty is, whether the *Bile* be a sufficient Instrument to produce these Effects: And if it be, whether it does get into the Blood, as I conceive. I shall not swell this Work with Arguments to prove these two Points; for one I think is on all Hands confess'd, and the other I think reasonable to be believed. What I deliver, I lay down *Problematically*, with free Liberty to all Mankind to examine it impartially, and shall be as ready to receive the Truth, however contrary to my present Sentiments, as I am now to impart my own Opinion.

Of Generation.

THE *Organs* of Generation have been already describ'd: But there remain some Doubts about the efficient Causes of it, which are not sufficiently adjust'd. It is agreed on all Hands, that there are in the *Ovaries* of Women little Eggs.

These Eggs, most Modern Anatomists, and the most Able till very lately, have maintain'd to be the *material* and *formal* Rudiments of the Body of the future Man, which the Seed of the Male did only impregnate and vivify. But that the *Ovum* it self did, before Impregnation, formally and materially contain the Body of the Man, though it could not germinate and increase till render'd Prolifick by the Seed of the Male.

This Opinion was first broach'd, and laid down with Strength of Reason, by our great Countryman Doctor *Harvey*, in his Book *De Generatione Animalium*. It procured almost universal Assent from the Writings of

that Author, and seem'd perfectly establish'd by *De Graaf*, till the *Microscopical* Observations of Monsieur *Lewenhoeck* grafted somewhat upon it, and took something from it.

That ingenious Gentleman, to whose happy Curiosity we are oblig'd for abundance of useful Discoveries, pretends by his Microscopes, to have discover'd in the Seed of the Male, as well *Humane*, as of divers Sorts of *Animals*, innumerable extremely minute *Animalecles*, moving with great Vigour and Celerity in the Fluid; which he maintains to be *Animals* of the *Species* of that Creature whose the Seed is.

The Communication of his Observation, has moved the Curiosity of abundance of other learned Men to make the same Inquiry, with such Glasses as he has describ'd; and by their own Acknowledgments, they appear to have done it with the same Success. I have had the same Curiosity; and must

must confess, that the Appearance answered beyond my Expectation, and came up to all the Representations that had been given of it.

The *Animalcules* (notwithstanding the very small Compass the Eye can take in at once thro' such a Glass) appear'd in prodigious Numbers, moving with great Velocity, diversly, and, as it seem'd, arbitrarily: Their Figure was exactly like that of *Tadpoles*, and they appeared in the Liquor black like them, and about the Size they are figur'd in the *Philosophical Transactions*, N^o 284. where a Description of them more at large may be found, what I have here said being sufficient for my Purpose.

This *Discovery* has been the Foundation of a new *Theory* of *Generation*, in which this *Animalcule* is supposed to be the entire *Fœtus*, and the *Ovum* before-mentioned to be only a Kind of *Matrix*, and to afford a *Pabulum* to the *Embryo*. For notwithstanding this *Discovery*, the Existence of true *Ova* in viviparous Females is not contested, nor is it indeed contestable.

I should very readily go into this latter *Hypothesis*, if I did not meet with some insuperable Difficulties (to me at least they appear such) which equally press either *Hypothesis*. The first supposes the Animal to be entirely included in the *Ovum*, before Impregnation; and that the Seed of the Male does only vivify, or give Life and Power of Vegetation, as we said before. The latter affirms the *Embryo* to be entire, perfect and alive, in the Seed of the Male; and like the Seed of a Plant, to want only to be cast into a Soil or *Matrix* proper for its Increase or Vegetation, which they suppose the *Ovum* to be.

But neither of these *Hypotheses* accounts fairly and fully for mix'd Generation: For besides the vast Variety of *Mongrel Dogs*, begotten betwixt *Sires* of different *Species*, there have been abundance of Observations of Mixtures of Animals of more remote Kinds; such as between a *Pheasant-Cock* and a *Hen*; a *Bull* and a *Mare*, which has been often enough observ'd to procure a particular Name, and is call'd a *Gimar*; a *Cat* and a *Rat*, (of which, however improbable it may seem, there is an Honourable Family that can produce abundance of Witnesses;) a

Buck-Rabbit and a *Guinea-Sow*, of which lately I have had a very credible Account. But the most common of all these Animals of mix'd Breed (except the Dogs) is the *Mule*, begotten by an *Ass* upon a *Mare*.

If the *Ovum* contain'd the form'd Animal, then the *Fœtus* ought to follow the *Species* of the *Mother*, let the *Sire* be what it will; because he contributes nothing but means of Life and Vegetation, the Animal being determin'd before-hand: And the *Kind* should be as certain as in *Plants*, where, let the Seed be thrown into what Soil soever, that does not alter the *Species* of the Plant, tho' it may the Growth and Vigour of it.

The same Objection lies yet stronger against the *Animalcules*. For if that *Hypothesis* be true, the *Sperm* of an *Ass* is full of little *Asses*; and the being nurs'd by a *Mare* should never make *Mules* of them, because the *Species* is pre-determined, and the Creature not only form'd, but living. I might perhaps as reasonably object, the Similitude the Children of the same Parents bear to their Ancestors; some to the Father's Line, and some to the Mother's: Which plainly shews, that to the Determination of the *Species*, both Sexes concur; and that sometimes one may prevail, and sometimes the other; which could not be, if both these *Hypotheses* were strictly or absolutely true. I know some endeavour to get over this Objection, by fancying that the different *Matrix* may have so much Effect, as to alter the Figure of the Animal so far, as may account for these mixt Appearances. But this is so poor, so unphilosophical a Shift, that it is not worth an Answer; and they might with as good Authority persuade me, that an Orange-Tree transplanted from *Sevil* to *England* would bear Apples; and so *vice versa*. It is a common Practice in Gardening, to graft one Fruit upon another Stock: But the Fruit still follows the *Species* of the Graft or Cyon, and bear like the Parent Tree, not the Stock it grows upon.

These Difficulties render both these *Hypotheses* unsatisfactory to me; and however old and exploded the Opinion of a *Plastick Power* on both Sides be, I must however embrace it, even tho' I know not exactly wherein it lies; at least till I meet with some-

what more sufficient to resolve my Doubts than hitherto I have done.

It is however agreed, that tho' the *Ovum* of the Female does not formally contain the Animal, yet in Impregnation that it is a *Causa sine qua non*, and that Generation cannot be without an Egg rightly disposed: And upon that Concession (which I think is at this Time universal) I shall proceed to examine some of the principal *Phænomena* of Generation, and the requisite Condition of Fœcundity, without concerning my self farther with the Animalcles of either Side; except only to observe, that the Existence of a form'd Animal in the *Ovum* has never been

proved, but supposed only from the Analogy it is imagin'd to bear to the Seed of Plants, in some of which the Figure of the Plant has by the Microscope been discover'd. The other *Hypothesis* seems to stand upon the Foot of Autopfy, but Reason, as we have observ'd, seems to be against it: And it is not impossible, but that these seeming *Animals* may be nothing more than some larger Particles of a mixt Fluid, whose Motion and different Figure the Microscope discovers to our Eye, while yet the minuter Parts will not discover themselves even that Way. But we leave these Things to the Arbitrement of the Learned.

Explication of Four Figures taken from De Graef, of the Organs of Generation in Men: Whereof Tab. VIII. shews the Genital Parts cohering, as they from within.

A. The inward Part of the Urinary Bladder.

B. The Neck thereof.

C, C. Parts of the Ureters.

D, D. Parts of the *Vasa Deferentia*.

F, F. The Seminal Vesicles.

G, G. The inward Part of the *Parasata* or Glandulous Body.

H. The *Urethra* lying to its spongy Part.

I, I. The spongy Part of the *Urethra*.

K, K. The Muscles that erect or extend the *Penis*.

L, L. The Beginning of the Nervous Bodies separated from the *Ossa Pubis*, which swell like a Pair of Bellows while the Yard is blown up.

M, M. The Skin of the *Penis* drawn to the Sides.

N, N. The Duplicature or Foldings of the Skin which forms the Prepuce.

O, O. The Skin fasten'd behind the Gland.

P, P. The Back of the Yard.

Q. The *Glans*, or Nut.

R. The Urinary Passage, whereby the *Glans* is perforated in the inward Part.

S, S. The Nerves running upon the Back of the Yard.

T, T. The Arteries in like Manner.

V. The Nervous Bodies joining together.

W, W. Two Veins, which unite together, and run out by the Back of the *Penis* in one large Branch.

X. The Veins opened, so that the Valves may appear in them.

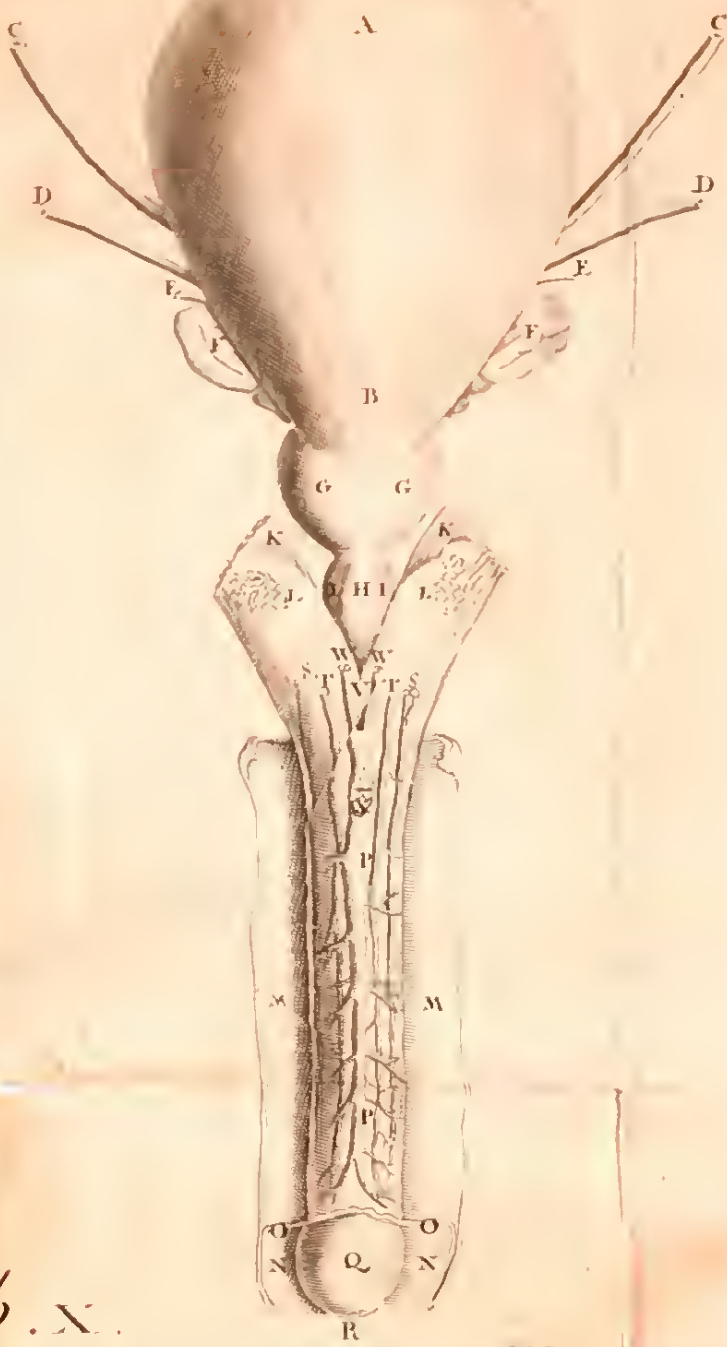


Fig. I.

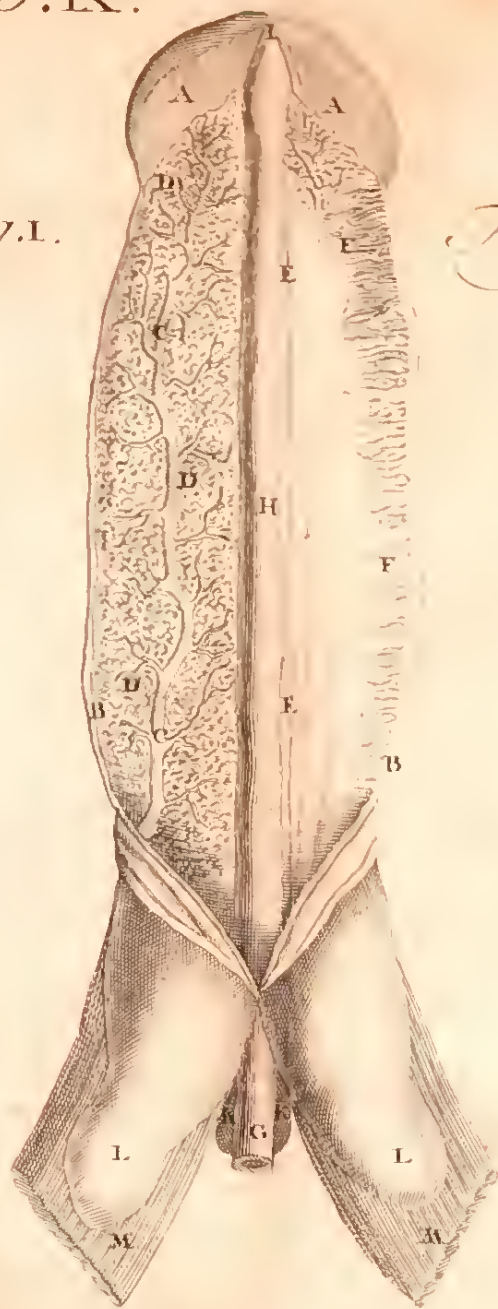


Fig. II.



Fig. III.

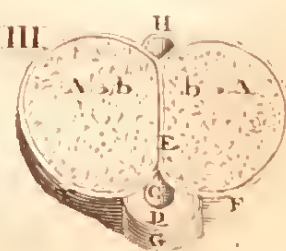


Fig. I.

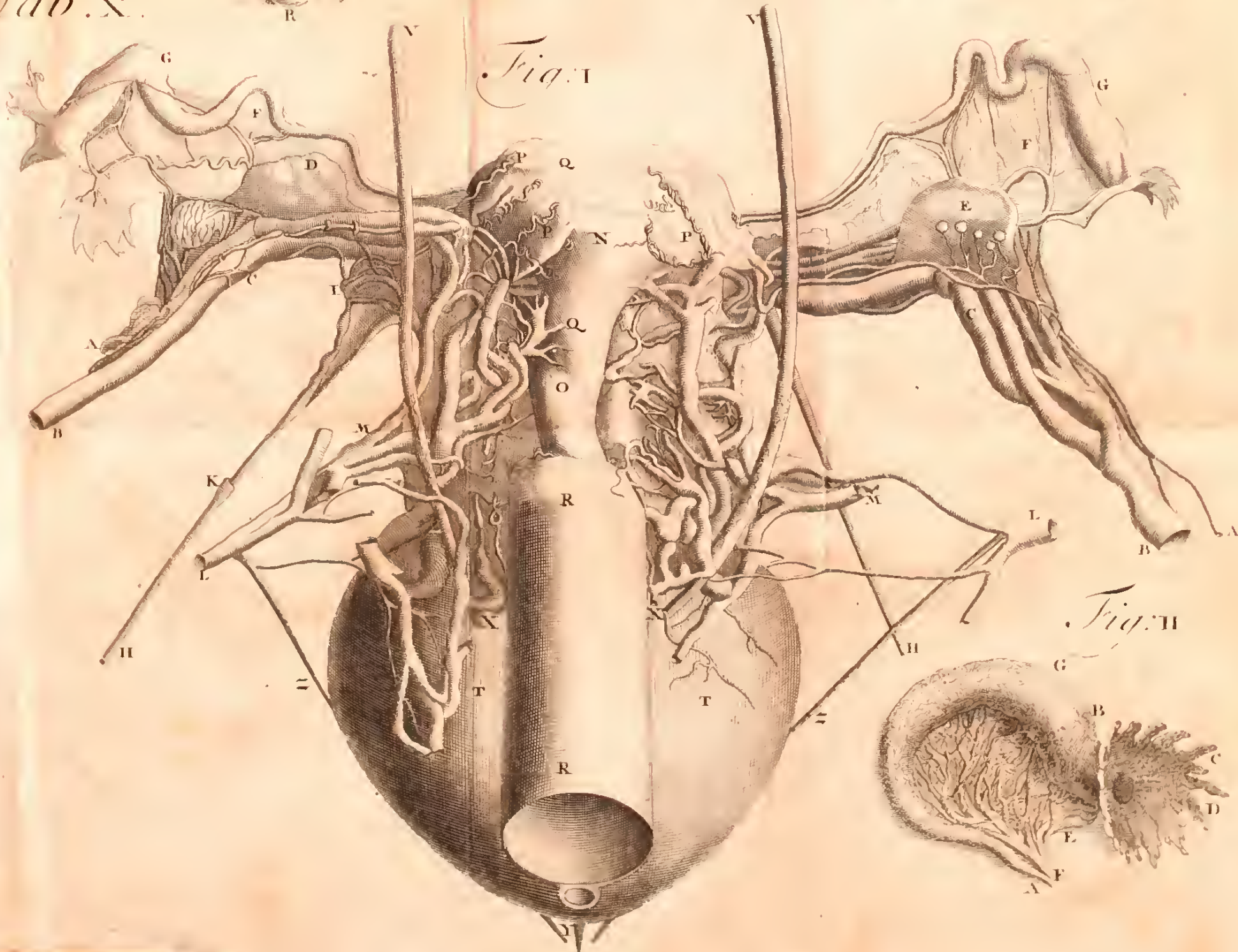


Fig. II.



TAB. IX.

T A B. IX.

Fig. I. Shews the *Virile Member* divided in the Middle, from the upper Part to the Urethra.

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| <p>A, A. The Glans of the <i>Penis</i>, with its Nervous Bodies divided through the Middle.</p> <p>B, B. The Membranes of the Nervous Bodies of the Yard laid separately aside by themselves.</p> <p>C, C. The Artery creeping along through the spongy Substance of the Nervous Body.</p> <p>D, D. The membranous or spongy Substance of the Yard, by which the Ramifications branch out.</p> <p>E, E. The <i>Septum Intermedium</i>.</p> | <p>F, F. The Origines of the Fibres of the <i>Septum Intermedium</i>.</p> <p>G. The Urethra cut off about the glandulous Body.</p> <p>H. The Middle of the Urethra.</p> <p>I. The End of the Urethra perforating the Gland.</p> <p>K, K. The spongy Substance of the Urethra.</p> <p>L, L. The Beginnings of the Nervous Bodies dilated like Bellows.</p> <p>M, M. The Muscles erecting the <i>Penis</i>.</p> |
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Fig. II. Shews the *Virile Member* opened lengthways.

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| <p>A, A. The Glans naked.</p> <p>B. The Bridle.</p> <p>C, C. A small Part of the Skin, from which the remaining Part that covers the <i>Penis</i> is separated.</p> <p>D, D. The Urethra subjacent to the Nervous Bodies.</p> <p>F, F. The Artery running through the spongy Substance of the Nervous Body.</p> | <p>G. G. The spongy Substance of the Nervous Body.</p> <p>H, H. The Orifices of the Arteries cut off, apparent in the Nervous Bodies.</p> <p>I. The Urethra.</p> <p>K. The spongy Substance of the Urethra.</p> <p>L, L. The <i>Septum Intermedium</i> of the Nervous Bodies.</p> |
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Fig. III. The *Virile Member* cut transverse.

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| <p>A, A. The spongy or fibrous Substance of the Nervous Bodies.</p> <p>b, b. The Arteries straggling through the Nervous Bodies.</p> <p>C. The Urinary Passage of the Urethra.</p> <p>D. The spongy Substance of the Urethra.</p> <p>E. The <i>Septum Intermedium</i>.</p> | <p>F, F. The strongest Membrane of the Nervous Bodies.</p> <p>G. The thinnest or slender Membrane, containing the spongy Substance of the Urethra.</p> <p>H. A large Vein creeping through the Back of the <i>Penis</i>.</p> |
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Explication of the Two Figures taken from Swammerdam.

T A B. X.

Fig. I. Which shews the back Prospect of the Uterus of a Woman
after Delivery.

- A, A.* The Spermatick Arteries.
B, B. The Spermatick Veins, which, after sending a Number of Branches to the *Ovaria* and *Fallopian Tubes*, have divers notable *Anastomoses* with the *Hypogastrick* Arteries and Veins about the Neck of the *Uterus*.
C, C. The Arteries and Veins that form on each Side the *Corpus Pyramidale*.
D. The Left *Testis* or *Ovarium* covered with its proper Membrane.
E. The proper Membrane of the Right *Ovarium* opened and expanded, to shew the Distribution of Arteries into the *Ova*, of which a few only of the least are here figured, that they may appear more distinct.
F, F. The membranous or broad Ligaments of the Womb, call'd *Ala Vespertilionum*, which the Spermatick Vessels traverse in the Way to the *Tubes*.
G, G. The *Cornua* or *Tuba Uteri*, reaching from the *Fundus* of the *Matrix* to the *Ovaria*, and serving for the Conveyance of the *Ova* from thence to the *Uterus*.
H, H. The round Ligaments of the Womb on each Side.
I. The Rise of the Arteries and Veins of the round Ligaments on the Left Side.
K. A Valve.
L, L. The two Hypogastrick Arteries.
M, M. The Hypogastrick Veins.
N. The Body of the *Fundus Uteri*.
O. The Neck of the *Uterus*.
P, P, P. The Arteries on the Body of the *Uterus* turn'd spirally, like the Tendrils of a Vine.
Q, Q. Numerous Veins of the *Uterus* appearing prominent through the exterior Membrane, and shewing divers *Anastomoses* scattered up and down.
R, R. The *Vulva*, or *Vagina Uteri*, reaching from the outward *Ostium* of the *Pudendum* to the inward one of the *Matrix*.
T, T. The lower Surface of the Bladder of Urine.
V, V. The Ureters descending to the Bladder.
X, X. The *Urethra* or proper Channel of the Urine cut off near the *Pudendum*, together with the *Vagina*.
Y. A Piece of the *Urachus*.
Z, Z. The Umbilical Arteries.

Fig. II.

Fig. II. *One of the Fallopian Tubes, with its Blood-Vessels filled with Quick-silver and Wind, to shew their Progress on one of the Ala Vespertilionum, with the Reticular Distribution of the Veins on the Parietes of the Tube, and its foliated Expansion, whereby these Parts become distended, and are rendered capable each of embracing the Ovarium on their own Side, in order to convey the Semen Masculinum from the Uterus, as well as to transmit the impregnated Egg afterwards to its Fundus.*

- A. That Part of the Tube next the Uterus.
- B. Its other Extremity, which is a little contracted before it makes its foliated Expansions.
- C. Its foliated Expansions here distended with Wind, as they are with Blood in Coitu.
- D. The Orifice at the Extremity of the Tube dilated.

- E. One of the *Ala Vespertilionum*, with its,
- F. Veins and Arteries continued from the Hypogastricks of the Uterus; the former, that is,
- G. The Veins, making a cavernous or reticulated Body on the Sides of the Tube.

Of the Generation, Formation, Nutrition, and Birth of the Foetus from the Mother's Womb. Taken from Harvey, Needham, Leeuwenhoeck, De Graef, Swammerdam, St. Hilaire, Tuvry, Mery, and Buffiere.

THE new Discoveries that have been made in Anatomy of late Years, plainly shew, that the Females contain in themselves whatever is proper for the Formation of the *Foetus*, but that it is the *Semen* of the Male which alone contributes to Generation; by the spirituous and volatile Parts therein, that diffuse themselves like a subtil Vapour to the *Ovaries*, and vivify the Egg, notwithstanding their Progress through the Vessels, and their Mixture with the various Fluids of the Body. Sometimes it happens, that all the Eggs have not the same equal Adhesion in the *Ovaries*, so that the Spirits acting upon or impregnating two or three, and sometimes more of them, they drop from the *Ovaries* into the *Tubes*, and

from thence fall into the Womb, where there are several *Foetus*'s formed. The *Semen* of the Male having penetrated the Eggs, it makes the Fluid ferment after the same Manner as Leaven ferments Paste. This Fermentation dilates and swells the Pellicles of the Egg, it drops out of the Socket, and the Membrane of the *Ovary* by its Contraction drives it out.

The more spirituous Part of the *Semen* is filter'd through all the spongy Passages of the Womb and the Tubes to the very *Ovaries*, much after the Manner as Water is filter'd through Paper. This seminal Spirit puffs up the *Matrix*, and occasions all those Disorders we observe after Conception; and it is the same Spirit that causes the broad Ends of the

the Tubes to approach from the *Ovary*: And as all this cannot happen but by a Fermentation of the nutritious Juices, there is a Necessity that the Nerves of those Parts should be irritated, which is the Reason that determines the Animal Spirits to flow into those Parts. If it is said, that Serosity or Moisture, which always wets the *Vagina*, and is sometimes so plentiful in Coition, do put a Check upon the seminal Spirits, and hinder their Activity; we answer, That the Liquor which is filtered by the Glands of the *Vagina*, is so far from lessening or abating the Force of the Spirits of the *Semen*, that it very much increases it, because it is spirituous, and being join'd to that of the *Semen*, causes a brisker and more subtil Fermentation.

The Egg being dropped from the *Ovary*, and descended into the *Matrix*, it is water'd afresh by that Liquor which is wholly fill'd with the spirituous Particles of the Male Seed; the Womb is extended abundantly more, the *Colledons* are tumefied, all the nutritious Liquids become more active, so that they cover the Parts of the *Fetus*; so that they encrease daily from the Nourishment they receive. The Fecundity of the Egg depends on the Rapidity with which the Spirits of the *Semen* insinuate themselves into it, to open all the Parts at once, by penetrating all the Canals or little Channels, so that they may be capable of receiving the Nutritions. This Aperture proceeds from the more spirituous Particles of the Male Seed, which having different Figures, and different Degrees of Motion, more readily penetrate the Matter of the Egg, by unlocking the Parts, and from a Chaos of Confusion, producing a regular Animal Body.

Mr. *Leenwenhoeck*, speaking of Generation by an *Animalcle* of the Male Seed, says, that being solicitous to examine the Generation of *Frogs*, upon the account of their young Ones being like a Worm, with a round thick Body, and a short Tail, he was surprized that the *Male* was not join'd to the Female in Copulation, but that he only sat upon her, and had no *Membrum Masculum*; that at the same Time when the Female cast her Eggs or Spawn, the Male also dropped his Seed, which is to be spread under the Eggs; in like Manner as the Seed of

Fishes that want the *Membrum Masculum* is cast under the Eggs of the Female, that the *Animalia in Semine* may conveniently impregnate the Eggs: For, continues he, I hold it necessary that some one of the Animals in *Semine* should get into a certain Point or Speck of the Yolk of the Egg, which Point is the *Cicatricula* which is only fit to receive it, and give it the first Nourishment, till such Time as the Egg comes to be sat on; but if no Animal should find or hit upon this Point, then the Egg is unfruitful; and this may be a good Reason why there are so many Thousand more Animals in *Semine Masculo* than Eggs in the Female.

In several of my Observations, says the same Author, I had not found the Animals taken out of the Testicles and *Vasa Deferentia* of Frogs to be alive: But on the first of April, when Frogs were ready to spawn, I took some of the Males sitting upon the Females and squeezed their hinder Parts, that I might get the Seed out of the *Vasa Deferentia*; but the *Animalcles* I then found moved but little, because the Matter they were in was full of salt Particles, which made me judge it to be Urine.

I then cut open the Testicles, and there I found an innumerable Company of *Animalcles* swimming among a Sort of ill shapen Particles. These continued alive till the next Day, tho' there were but a small Quantity of Liquor to contain them. I judge the Bodies of the *Animalcles* to have been of the Thickness of $\frac{7}{8}$ Part of the Hair of my Head. If the Matter they moved in had not been so thick, I should have seen them much plainer; but I have described them to the best of my Apprehension. The first *Animalcle*, as it lay in the watry Matter, and moved it self therein, had the Head sometimes appearing thicker than at others, and often I could but see Part of the Body. When the Animal moved it self strongly, tho' the Progress was but little, the Motion towards the Head was like that of a Snake, and the Tail was cast into 3 or 4 Bows. I observed another *Animalcle* lying dead, and stretched out at Length; but in this Posture I saw but few, for many that were dead lay with the fore Part of their Body bent in, others made as it were a half Circle, others had

had the fore Part of their Body bent, and moved their hinder Parts. These last I took to be ready to die.

The Number of *Animalcles* in all the Seed was so great, that I reckon there might be 10000 of them to one of the Female's Eggs. The same Computation I formerly made of the Milt of a *Codfish*; but it must not be thought that all the Animals in the Milt of a *Codfish* live together, but only such of them as are nearest the Passage they are to be cast out of, and who have more Moisture about them: The rest of them being more remote in the Body, and being incompass'd with a thicker Matter, are not alive; for tho' some Fishes, as the *Bream* and *Trout*, cast their Milt and *Spawn* in two Days Time; yet *Codfishes* are about a Month in doing it, in all which Time the Seed is successively ripen'd and perfected: So also are Frogs, by what I have experienced, for the first Animals I thought were dead, and though I afterwards found live Ones, yet those were dead that lay deepest in the *Testicle*.

'Tis well known, that when a Cock hath trod a Hen but once, many Eggs are made fruitful: The Reason that I give for it is, that many of the Eggs in the *Ovary* have each of them received an *Animalcle* out of the *Male Seed*. This *Animalcle*, while the Egg is late upon, does not presently take the Figure of a *Chick*, but grows into a disorderly Bulk, wherein the Heart is first plainly to be discern'd. Other *Fœtus's* have a different Way of Growth: The *Louse* has all its Parts, and is a Breeder, while it is yet in the Egg. The *Flea* shows like Globules swimming in a watry Substance; it afterwards becomes a Worm, and then a *Nympha*. The *Frog* is a thick Worm till it be of a considerable Bigness. The Humane *Fœtus*, tho' no bigger than a Green Pea, yet is furnished with all its Parts. I have often endeavoured to discover the Animal coming out of the Male Seed in the Egg of the *Hen*, but have been unsuccessful, tho' some of the Globules of the Egg have magnified to the Bigness of common Apples. This Disappointment has put me upon the Eggs of Insects, as the *Flea* and *Louse*, which being very small, may be so much the fitter for this Discovery.

A certain Physician, writing of Generation, sets down these Words in the Margin: *From the Female Seed the Fruit must grow, however the Thing came to pass.* This he enlarges upon in the Text; but I think, under Correction, that by one Instance I shall bring a sufficient Proof of the Fruit's coming from the Male Seed, and the Female's only contributing to the Nourishment and Growth of it. Many of our Neighbours, either for their Pleasure or Profit, keep tame *Rabbits*, which are large, long eared, ordinarily of a white Colour, but sometimes of a blue, black, and pied; those that would make a Profit of these *Rabbits*, by causing them to bring gray young ones, which in the fore Part of the Year may be sold for a wild Kind, get a gray *Male*, such as are commonly found on our *Sand-hills*, to put to their *Female*. The Brood that comes from hence always takes the grey Colour of the Male, and it has never been seen that any of the Young has had any white, or other coloured Hair than grey: There with all they are never so big as the *Dam*, nor have so great Ears, nor are so tame, but are of a wilder Kind.

The first *Frog* which I anatomized lay on the Ground in my Way, and seemed so weak through Cold, that tho' I kicked it with my Foot, it would not leap away. This proved a Female. In the Guts of it I found *Worms*, like those in Children of about the Bigness of a Hair of my Head. The Blood consisted of flat oval Particles, swimming in a clear Liquor. These had no Colour as they lay singly, but when two of them lay upon one another, their Colour was stronger; but there was another small Oval hard by, which showed of a higher Red than the three others. Many of these oval Particles were very pleasant to look upon, especially when the Moisture wherein they swam, having also Globules on the Surface as big as a 6th Part of a Blood Globule, was evaporated; for some had in the Middle Shade, others appeared as if they were made of several Ovals of unequal Bigness, others seemed to be set round with small Globules, others had no Globules in the Circumference, but several in the Middle. These Globules, I believe, were at first swimming in the watry Liquor under the *Ovals*, tho' now they cleave to them.

Upon the Plate whereon I laid the Frog that I anatomized, I found several Animals moving in a watry Blood. They were about half the Bigness of the oval Particles, and about 50 of them might lie in the Space of a Sand. These I had never seen in the pure Blood, nor could I perceive them in the Water that came out upon ripping the Skin from the Flesh, or upon opening the Belly, or squeezing the Head of the Frog, to make it lie quiet upon the Plate. At length, in the Month of June, I met with some Frogs whose Excrement was full of an innumerable Company of living Creatures of different Sorts and Sizes: The whole Excrement besides was so full of living Things, that it seemed all to move, and I guess'd there was not less than 1000 of the Sort like River Eels in the Compass of a Sand. From hence I concluded, that the Animals found among the Blood might come from my cutting a Gut.

By the Way, I observed something of the Damage that Frogs may do to Fish-ponds; for I took out of some of their Stomachs 8

or 10 young Fishes. I took notice of a small Vein, of about the Thuckness of a Hair, that when the Blood was cut out of it, the Coat was like a Frog's outward Skin. The same Coat of the Vein was made of Threads or Filaments running by the Side of one another, just as if they had been wound close about a small round Stick, so as to cover it all over. Now if there be *Capillaries* in the Body a thousand Times less than this which I examined, how thin must the Threads necessarily be of which the Coat is made? And how easily must these Threads be separated and divided from one another, so as to let the Blood, when it is very forcibly moved in the Arteries, start out between them? And I was the more confirmed in this Opinion, upon spreading hard the Coat of the Vein, for I then saw through it, as through a Hair Sieve. Hence may a probable Account be given of *St. Anthony's Fire*, *red Swellings*, or the *Small-pox*; and perhaps the Blood may be more gently strained through these Passages for the nourishing of some Parts of the Body.

An Account of a Book concerning Generation: Writ in Italian by an Anonimous Author, and dedicated to Seignior Malpighi.

THE first takes notice of the Opinion of the *Schools*, which taught two Sorts of Generation, either by the Seed of the Animal, or spontaneous out of Corruption, and says, the Moderns reduce those two to one, and having observed the Uniformity of Nature in most of her Works, have gone yet further, and ventured to prove, that the general universal productive Principle of all *Species* is *ex Ovo*; and this he endeavours to pursue in the Works of the Ancients as well as Moderns, and out of Scripture as well as Philosophy: But one Passage is remarkable out of *Hippocrates*, in his Book *de Natura Pueri*, where relating the Case of a young

Woman who in dancing miscarried of a *Fetus* of six Days old, he says it was like a raw Egg, the Shell being first taken off; and therefore in the End concludes, that the Nature of the *Oviparous* differs not from that of Man.

But still there seemed to be much Difficulty in the Production of Insects, till Signior *Redi*, as this Author says, did by many uncontestable Experiments prove them to be generated out of Eggs, and by that convicted of Error the Natural Histories of *Aristotle* and *Ælian*, shewing the Necessity of a new more accurate one, which he owns is with much Glory pursued by the *Royal Society* of

London, as well as that of Paris and Florence; and particularly makes very honourable Mention of Dr. Lister, for his History of Spiders and Snails; and of Mr. Ray, for his being the first Discoverer of their being all *Hermaphrodites*, or *Androgina* as he terms it.

After this, he says, the Thing seemed out of Dispute, when out came a Book, called, *The Recreation of the Eye and Mind, in Observations upon Snails*, by Father Philipppo Bovain, a Jesuit. It being a pretty large Volume, containing the Natural History of all the Snail Kind, where he not only doubts of their Production by Eggs, but also endeavours to overthrow most of Signior Rhedi's Experiments, that tended to establish the Principle of an Univocal Generation: to which he prefers the old Principle of Corruption for the Insects.

While he was reading this Book, he says, it was his Fortune, in taking up some Flowers, to observe by a Border a Cluster of little Eggs, which had nothing in them but the White, like the White of an Egg; but upon a more diligent Search, he found another Cluster as big as would fill the Palm of his Hand, out of which came young Snails, some having but just broke the Shell, others being half out, and others quite out, with the *Testa* of the Egg fasten'd to the Tail of the Animal. He says, the Eggs were no bigger than Pepper Corns, and those most white; but those which were ready to break tending towards yellow: They were fasten'd in a Lump by a Kind of glutinous Water, and this was about the 10th of July. This Discovery being very plain and remarkable, he called in to see it many learned Persons, and some of good Quality, whom he names, that the Truth of his Person may be out of Dispute.

This done, he examines the Jesuit's Reasons against this Univocal Generation, which are in all four: 1. *Aristotle's* Authority. 2. A Principle of his, that testaceous Animals have not the Difference of Sexes. 3. A Maxim of the same Philosopher, that no exanguinous Animal is Oviparous. 4. A Collection of some Observations to confirm *Aristotle's* Reasons. The three first are answered by Experiments which confute him, and observes, that *Aristotle* himself, who had more carefully observed the *Murex* and

Buccina, owns, that in the Spring they use to get together, and produce a Substance like a Honeycomb, full of little Bodies as big as white Vetches, which may be thought to be their Eggs. As to the 4th of the Father's Observations, he says, he will say nothing, but confine himself to his own, which he thinks he has sufficiently demonstrated.

Extract of a Letter of Monsieur de St. Maurice, M. D. to Monsieur de la Closerie, concerning the Formation of a *Fœtus* in the Testicle. Taken out of the *Journal de Medecine*, published at Paris.

I Think, Sir, that after what lately happen'd to Madam de St. Mere, we ought no longer to doubt of the Formation of the *Fœtus* in the Testicles of Women, and consequently of the Existence of Eggs. This Lady, whose Merit is known to you, had been brought to Bed eight Times as prosperously as might be, and after having continued Five Years without being with Child, insomuch that she thought her self freed from those Sorts of Labours, about three Months since she suspected her self to be fallen into that Condition again; because having never failed of being very regular, and not finding her self ill, she was more than a Month without her ordinary Relief: But whilst in this State she had a little Show, which scarce left her wholly during the two last Months of her Life, and which she pass'd nevertheless without much Trouble, so that she thought her self to be secure, as to the Point of her being with Child; but that the 22d Instant, after she was up in the Morning in very good Health, and had been writing about an Hour, she fell into Faintings, which made her lose absolutely her Pulse from that Moment, without depriving her of her Understanding or Speech.

Mr. de Saint Mere, who took this Faintness at first for an Effect of Vapours, was not alarm'd at it, till feeling her Arm, he found her without any Pulse. This Privation, join'd with a mortal Paleness, amusing him, he sent a Man to intr eat me to go and see her. I came about eight of the Clock in the Evening, found her cold, and wholly without any Pulse; her Countenance deadish, and covered with a clammy and cold Sweat, having still an entire Understanding,

and her Speech strong. She complained of a great Cholick in the Region of the Right Groin, which terminated at the Reins. This Cholick was so violent, that as I was going to touch the Place, she prayed me not to press it, and told me I should make her fall into a Swoon. In a Moment after, she felt all the Preludiums of an imminent Travel. She called for her Chirurgeon, and died in his Arms, saying, I am delivering, I am delivering. There appeared outwardly neither Distillation nor Flooding, nor any Mark of this Disorder. A Death so little expected amazed every Body, and surpriz'd so much *Monsieur de St. Mere*, that he was desirous to know, whether opening the Body would not discover the Cause. *Monsieur de la Chiese*, a Surgeon, was made Choice of to do it, and I was prayed to assist *Messieurs, de Montanzon*, Advocate of *Perigomez*; *de la Porte*, Gentleman to *Monsieur le Comte de Taleran*; *du Vaire*, Apothecary to *St. Mere*; and two Valets de *Chambre* of the House, desired to be present at the Opening; and this is what we found:

As soon as the Chirurgeon had opened the Integuments of the Belly, we saw in the Epigastrick Region all the Entrails floating in Blood. I caused two Pounds to be taken out with a Spoon, to avoid changing the Situation of the Parts; after which, seeing that there remain'd in the Right Flank a prodigious Quantity which was coagulated, I tried my self to take it out with my Hand; but judge, Sir, how I was surpriz'd when, among the first Clots which I drew forth, I found a little Foetus, about the Bigness of a Thumb, a third less in Length, all very distinctly form'd, and in which was manifestly discovered the Sex of a Boy, but naked, and without covering. I put this Foetus upon a Plate, and shew'd it to all that were present; and being impatient to know from whence it came, I applied my self with all Exactness to examine all the neighbouring Parts of the Place whence I took it. Two Fingers from this Place I found the right Cornua of the Womb, but my Amazement was doubled, when I found the Testicle torn lengthways, and through the Middle, on the Side that it did not touch the *Tuba Fallopiana*, and all its Cavity full of clotted Blood. I no longer doubted but this was the Place where this Infant was formed, and I conceived, that having acquired in this Place a

Growth too great to be able to fall in Time, and having continued to grow there, without being able to come forth, it had at length broken its Prison by stretching it.

I was confirm'd in my Opinion, when, comparing this Testicle with the Left, I found it at least four Times bigger, its Bulk approaching that of an Hen's Egg, and the Left not being larger than a small Chestnut. It was all red without and within, besides the clotted Blood that it contain'd, whereas the Left was pale, and full of little Grains of the Colour and Consistency of yellow Tallow. I examined the Tube on the right Side, and I could not find that this Infant had ever entered there; it was in all Things like the Left Tube. Lastly, I examined the Body of the Womb with all the Care and Exactness that might be; it appeared to me every where without any Rent, and in a State purely natural: I only observed, that it was a little bigger and softer than it is found in Women who die without being with Child. It was all as *Doctor Harvey* has describ'd it in the first Month of Pregnancy. I caused a Probe to be put into its Cavity by the Vagina, and then to be cut open, and I found not the least Sign of Conception. Indeed the Vessels of the interior Membrane appeared to me full of Blood, and varicous as it were, which doubtless was the Cause of that little Show of Blood as before-mentioned.

Tho' it were needless to search elsewhere for the Death of this Lady, we nevertheless examined all the other Parts of the Belly, and of the Breast, and found them all well in Order, and in a State purely natural. I leave you now to judge what may be concluded from all this, since no Person can draw better than your self the Consequences which necessarily follow from this Phenomenon. Authors speak of certain Foetus's found in the Tubes, as *Cyprianus* hath related a Case (which will be inserted in its proper Place); and others that have been found in the Cavity of the Belly, the Womb or Tubes not being any Way lacerated. But I do not think that any Person hitherto has been able to shew that the Conception is made in the Testicle or Ovarium, as it seems the Fact now related does manifestly demonstrate. And it is this which has made us think hitherto, that the Opinion of Eggs had till now need of Proofs to support it.

A Letter from Monsieur Buisiere, concerning an Egg found in the Tuba Fallopiana of a Woman lately dissected, with some Remarks touching Generation.

THE Subject hercof was a young Woman of about 25 or 26 Years of Age, which had been but lately delivered of a Child, as appeared to the Author from the following Reasons: First, because the little Breaks or Cicatrixes of the Cuticle of the Belly were yet fresh; Secondly, because the Laceration betwixt the Legs was not yet heal'd up; and Thirdly, it appeared from the Largeness of the Matrix, and in short, from the opening of the Ovary on the Left Side, by which the Egg, which had supplied the last Child was driven out, and which remain'd as yet very large, one Side being a little torn. Notwithstanding this, that it had been so short a Time from her last Delivery, she had an Inclination to be debauch'd again; or perhaps she did it with Thoughts to be got with Child, and so prevent the Execution of her Sentence, which was to die. However she took the Diversion with some Friend, or one of her Fellow-Prisoners, so that she conceived; but being executed before the Egg impregnated by the Virile Seed had Time to be convey'd into the Uterus, when I opened her, says this Author, I found, that the Cornua on the left Side was extraordinarily dilated towards its Extremity, and that that Dilatation, in its utmost Largeness, was little less than an Inch in Diameter, and stretch'd almost an Inch and half in its Decrease from the Side of the Matrix. This Part being dilated, bent it self back, and embraced almost all the Ovary from the Membrane, to which it was so firmly knit, that it could not be rent off but by Force. When it was torn off, there flow'd from it a limpid and unctuous Liquor, which was apparently of Use to it, either to relax the Membranes of the Tubes, in order to dilate them, so that the Egg might slip easily into the Matrix; or possibly to lubricate and render the Parts slippery, so that the Egg might pass without Pain; or perhaps for both these Ends. I examined pre-

sently if there was nothing corrupted in the Body of the Tube which might produce this Liquor; but I could not observe that there was any Fault, but that it was something thicker than ordinary. This Thickness was occasioned by the Swelling of the Fibres, which were as fleshy as those of the Muscles, which happens undoubtedly in this Condition only, in order to give such a Force and Motion to the Part, as is necessary for squeezing out the Egg, after it is loosened from the Ovary, and to push it into the Matrix. It is my Opinion, says this Author, that this Liquor contained in the Tube comes from the Ovarium, and that the Fibres and small Lymphatick Vessels, or others, that break to open a Passage for the impregnated Egg, let this Liquor flow, so that a Rent of the Ovary makes a Wound, and produces a Symptom which is useful, and perhaps absolutely necessary, either for the first Nutrition of the Egg, or to facilitate its Passage into the Matrix; for Nature works every Thing for its own Advantage. And that which confirms me in this Opinion is, that in Females where there are several Eggs broke off at once, this Liquor is found in great Quantities. I have lately been so happy as to find, that in a Sow in the same Condition, the Cornua on each Side that embraced the Ovary contain'd each of them about three or four Ounces of this Liquor.

The Cornua being loos'd from the Ovarium, and the Liquor poured out, the Egg appeared naked. It was of the Size of a Hazel Nut, surrounded with Liquor in the Middle of the Cavity dilated from the Tube, three Fourths of this Egg being slipped out of the Ovary by the Hole which it had made, so that look'd as if it held by nothing: Notwithstanding, when I went to take it away, I found it hanging by a hard String, across which run the Blood Vessels, to supply it within and without. It is by these Vessels that the Fœtus receives Matter for Growth and Nutrition, not only in the Ovary, but likewise in the Matrix, this String or Stem serving to form the Placenta, by clinging to the Body of the Matrix. It is also by this we form a Conception how the seminal Spirit of the Male is convey'd into the Body of the Fœtus in the Egg, to give it Motion and Facundity.

An Observation of an uncommon Case of a Dropsy, contained betwixt the Tunicks or Coats of the Womb. Taken from the Philosophical Transactions of the Royal Society; January, 1693.

A Person, aged 44 and upwards, some Time after she was married, had conceived, as she thought, by some supposed Symptoms of Pregnancy, and in order to her Delivery, at the Expiration of her Reckoning, her Midwife was consulted: Her fancied Pains came on, and she thought her self very near her Labour. Her Belly was grown very big, had gradually increased from the Time of her imagined Conception; but alas, she found her self deceived in her Expectation, and her Preparations for this Time all in vain. Her Illness shortly after wore off, without leaving any Prognostick of an approaching Birth.

Thus she continued, growing bigger and more indisposed, till twice the Time of her Reckoning was compleated. Those whom she consulted for Help, knew not by what Means to relieve her, as not knowing what her Distemper was. Some thought she had a Tympany, some that she was *Ascitical*, and others, that she carried a dead Child in her Womb. She had taken much Physick, but without Relief, and at length made her Application to an eminent Physician; who, after due Enquiry into the Circumstances, put her in Hopes that she was with Child, and by taking his Prescriptions, in all Probability she might very speedily be delivered of a Humane *Fœtus*, either dead or alive. These Remedies were taken as ineffectually as many others, so that now she began to despair of Recovery, yet lived many Months afterwards: And last of all, at three Years End from the Time she first thought her self pregnant, she referred her self to a Man Midwife, and was then put under a Course of Physick again, wherein she took many

powerful Hysterick and other Uterine Remedies.

It was now without much Question concluded that she laboured of a *Mola*, or that a false Conception was engendered, by one of Nature's Aberrations, instead of a true one. The Cause being now, as was thought, found out, there remained nothing but to endeavour its Expulsion. This was attempted with no better Success than formerly, so that after all she removed into the Air, where she had not continued long before she languished and died.

There remained nothing but the Opening of the Body, which was concluded on, in order to detect this so occult and contumacious a Distemper. We who were to make the Inspection met with her Physician, and the Corps being laid as advantageously as might be, we began our Incision from the *Umbilicus*, transverse the *Abdomen*, to the *Iliæ*; and from the same Centre another Incision direct to the *Os Pubis*. Here was now an Expectation on all Hands of something rare and monstrous, when on a sudden one of the Dissectors, little thinking what was so near, in cutting through the *Peritonæum*, accidentally thrust his Knife too far, and immediately there arose a Spring, as it were, of a limpid *Serum* or *Lympha*, as clear as Water from a Fountain, rising up a very considerable Height, and with great Impetuosity.

This put an End as well to Conjecture as Dispute, we now fully concluding the Distemper to be an *Hydrops Uteri*, or a Dropsy contained within the Cavity of the Womb. Having emptied the containing Part of its Water, which in Quantity did somewhat exceed two Gallons, we proceeded to satisfy

our selves wherein this Deluge had been contained. We found its Enclosure was a thin transparent Membrane; and yet, notwithstanding its extraordinary Dilatation, I could not persuade my self that it was the entire Body of the *Uterus* it self. Upon a more strict Search, when I turned this Membrane to the right Side, I perceived underneath this outward Tunick, or as I thought, adhering to it, a more carnosus Substance. To clear this Suspicion, the *Os Pubis* was divided, which finding very difficult to be performed with a Knife, I finish'd with a small Saw.

I cannot choose but take Notice in this Place of some Peoples Over-Credulity, and to wonder that we should be so easily persuaded to set the Light of our Understanding in the dark Lanthorn of Authority, when we take for granted that these Bones, *viz.* the *Share* or *Pubes*, do separate or part asunder of their own Accord in Time of Travel, in order to facilitate the Birth of the *Fœtus*.

The *Pubes* being divided, we passed in a Probe through the *Pudenda* into the *Vagina Uteri*, and having traced it as far as it went, by looking into the *Pelvis*, and searching for that carnosus Substance I have already spoken of, we found it to be nothing less

than the *Uterus* it self; when cutting into its Body, we perceived the End of the Probe already entered into the *Cervix* or Neck thereof; so that what seemed to us strange, we were at length ascertained of the Truth, and convinced, that the aforesaid Water was contained in the external Tunick of the Womb, whose great Weight had thrust the Pody thereof perfectly on one Side, and hindered an Admission of Search from the *Vagina* towards the *Fundus Uteri*, the *Cervix* thereof being kept close, as in a true Conception.

One of the great Indications of this Woman's Pregnancy, was a Flux of a whitish or pallid Humour to her Breasts, which she could squeeze out at Pleasure, and thought it to be no other than Milk generated therein, in order to the Nutrition and Conservation of a future Birth. She had likewise laboured the greatest Part of the Time under a Suppression of the *Menses*, whose Reflux to the Breasts, when an Alteration had been induced by its Glandules, might, as I conjecture, issuing from the *Papillæ* under a subalbid Form, be taken for Milk, and give Grounds of a Suspicion that she had conceived.

The Conduct of Nature in forming an Animal from an Egg, &c. By St. Hilaire.

TO discover the Method which Nature pursues in forming an Animal from an Egg, we ought to consider, with *Fabricius ab Aquapendente* and *Harvey*, the Hen's Egg, both before and during the Time of Incubation or Sitting. Before Incubation, we find in the Tunick of the Yolk of the Egg, a little white Spot, in Shape of a Circle, that is like a small Lentil, and is called a *Cicatrice*. During the Sitting, the *Cicatrice* dilates it self, and stretches the first Day into several Circles, and the second Day we may observe a certain clear and shining Liquor finer than Chrystal, which, for a certain Reason, is called a *Jelly*.

The third and fourth Day we may perceive in that Jelly a Streak of florid Blood, and the *Punctum saliens* in the Middle of the Jelly, which is the first Formation or Discovery of the Heart. We may take Notice afterwards, besides that Point, of something thick and whitish like a Cloud, divided into two Parts, the larger whereof is the Matter for the Head, where we may see four little Bladders, which are the *Brain*, the *Cerebellum*, and the two *Eyes*. The other Part is much less, and underneath is represented the Keel of a Ship by the Spine of the Back, and by Degrees you will see the *Arms* and the *Legs*. In short, the *Viscera* clog-

successively to the Vessels that convey and inclose the Blood, and so perfect the *Fœtus*.

Malpighius observes, that the *Fœtus* is inclosed or wrapped up in the *Cicatrice* before Incubation; so that the Head, the Spine, and their Appendices, are plainly distinguish'd in the small Tunick that swims in the Jelly of the *Cicatrice*, as the *Fœtus* in the *Amnios*; and likewise, that the Parts of the Chick pre-exist in the Egg, and precede the Incubation; in the same Manner as Seeds, or the Eggs of Plants, which inclose or contain in them certain Roots or Buds, from whence the Plant grows, which being decay'd or rotten, all the Virtue and Hopes of that Generation is destroy'd. The Shoot or Graft is nothing else but the Design or Plan in Miniature of the Plant; so all the Parts of the Chicken are potentially in the *Cicatrice*. They encrease successively, according to the Order of Time, from the first Impregnation of the seminal Spirit, according to the Intention of the Creator. He concludes consequently, that the Head, the Brain, the Marrow, and other Parts, appear ordinarily in the Egg, or in the *Cicatrice* before the Formation of the Jelly, and before the Motion, or its Change into Blood, and that the Chicken is in the Egg, with the Tunicles or Coats, before its Exclusion from the Hen.

The *Matrix* or Womb of a Woman with Child being opened, we presently see that fleshy Substance which *Fallopins* called *Placenta Uterina*, and others *Hepar Uterinum*, the Burden, or After-birth; some call it the Womb-Cake. This *Placenta* is a fleshy *Viscera*, and very soft, being composed of a great Number of very small Vessels, and of Blood, by Means of which the *Fœtus* is tied to the *Matrix*, chiefly at the Bottom thereof. There is usually but one when there is but one *Fœtus*; but in a double Conception nothing is more certain than that each *Fœtus* hath its distinct *Secundine*. The Substance of this Part is peculiar to it self. It is soft, lax, easy to break, uneven, in several Wrinkles or Folds. It is altogether fibrous, and wove with an infinite Number of fine Filaments, and small delicate Vessels, tumid with coagulated Blood spread through the whole, just like the *Parenchyma* of the Liver. 'Tis of a dark or deep red Colour, not like the

Spleen, but something redder, and seldom pale. The Shape is something circular, but the Circumference unequal. Its Size and Thickness vary according to the Disposition of the *Fœtus* and the Parent. The Surface of the *Placenta* is on the concave Side, towards the *Fœtus*, even and smooth; but on the Convexity of it, it is rough, spongy and uneven, by which Means it sticks to the inward Parts of the Womb, which at that Time affords Nutrition plentifully to all the necessary Parts. It receives into its Middle, or thereabouts, sometimes a little on one Side, and sometimes a little on the other, the *Navel-string*, which is tied to it with the Vessels by the Intermediation of which the necessary Communication is established which is betwixt the *Placenta* and the *Fœtus*. The Veins and the two Umbilical Arteries insert themselves into the *Placenta* by a Multiplicity of Roots, by which they mix and interweave themselves into the very Substance thereof after a most wonderful Manner.

The *Placenta* is tied to the *Matrix* by Means of the *Cotyledons*, which are nothing but the Elongations of the Vessels or other fleshy Advances or Teats of the Womb. This has some Resemblance to the Herb *Cotyledon*, which the *Latins* call *Umbilicus Veneris*; or they are called *Acetabula*, because like small Vessels or Sawcers in which they were used to bring Vinegar or other acid Liquors to the Table. During the Time of Gravitation, we may see in the *Matrix* several small Nipples of a strong delicate Contexture, which are united with the Vessels of the *Placenta*. These Nipples are composed of many small Pellicles, that form a reticular or Net-like Body, and this is made of little round and long Bodies of an Ash-Colour, which is like the Caul of Fishes. There are several Blood Vessels that belong to the *Placenta* and the *Chorion*. The Use of the *Placenta* in the Woman, is partly to sustain or support the lacteal umbilical Vessels, and carry on the Communication of Parts, and partly to prepare a particular Nutrition, that may be proper for the adjacent Parts, as well as the Nourishment of the *Fœtus*.

After the *Placenta*, there immediately follows two Membranes that wrap up the *Fœtus*, and inclose him as it were in an Egg, which, be-

because they are join'd together, come together with the *Allantoides* and the *Placenta*, out of the Womb, after the Infant is born.

The *Chorion* is the external Membrane that surrounds the whole *Fœtus*. It is thick, interwoven of several Fibrils in the Nature of Threads, internally a little uneven or rough, on the Outside here and there laid in with a small Matter of Fat, and at the Place where it is fixed to the Bottom of the Womb by Means of the *Placenta*, it has several Blood Vessels that come from the *Placenta* and the umbilical Vessels.

The *Amnios* is the internal Membrane that covers the *Fœtus* most immediately. It is extremely thin and delicate, soft, smooth, and transparent, separated from the *Fœtus* by a pretty good Distance, and supplied with very fine Vessels, that are scarce visible, which proceed from those of the Navel. Besides these two Membranes, *Needham* discovered a third very thin one, that is transparent, concave, and without Vessels, seated betwixt the *Chorion* and *Amnios*. It is very properly called the Urinous Membrane, and is established with good Reason instead of the *Allantoides* of Brutes, because the Urine of the *Fœtus* may be collected betwixt that and the *Chorion*, and so preserved till the Time of Exclusion.

It happens sometimes in the Birth, that a Part of the *Amnios* is broke, and remains fix'd to the Head of the Infant, who is born with it, as if he had a *Cap*, *Coif*, or *Caul*, on; from whence those Children are said to be wrapped in their Mothers *Smocks*: And the Matrons at that Time are wont to presage good or ill Fortune to the Child, according to the different Colour of the *Cawl*, which they preserve with Care, to make good their Foreknowledge, and to strike Terror into the Parents, whom sometimes they persuade into a Belief, that without that be dried, powdered, and given to the Infant, it cannot prosper.

When a Woman has conceived Twins, these are inclosed but in one *Chorion*; nevertheless each particular *Amnios* that contains the Milky Humour is distinct, as it is usually met in Walnuts and Almonds, in which tho' two Nuts seem to be inclosed in one Shell, nevertheless each hath a particular Membrane or Skin, by which it is separated

from the other. If it happens that either of the *Amnia* of the Twins break by a Stroke, Bruise, or any other Accident, or perhaps that they were not distinct at first, then the *Fœtus's* unite and stick together, according as they touch one another, and by this Means Monsters are produced. It likewise often happens, that each *Fœtus* is wrapped in a different *Chorion*.

As it happens sometimes that in Hens Eggs we see two Yolks, with their Whites divided by a very fine thin Skin, but inclosed in one hard Membrane or Shell, and that such Eggs, tho' fecundated by the Communication of the Cock, being set under the Hen, shall rarely produce two distinct Chickens rightly formed, but one only, and that deformed and monstrous, having four Wings, four Feet, two Heads, &c. and that by reason that the Membranes that should have divided them are broke, and the two Chickens close so intimately, that they can make no other than one monstrous Production. The same Thing likewise may happen in the Eggs of Women, that two Eggs being wrapped together under one Covering, only that makes the *Chorion*, and then if the Membranes of the *Amnios* are also solid, the Twins keep separate one from the other, the Navel Strings which proceed from each of them insert themselves together into one *Placenta*, sticking to the *Chorion*, and then being arrived at their Maturity, they issue forth at the Birth separately, each in particular, and after the Birth of the last *Fœtus* comes the *Secundine* which has contained them both in the Womb: But if the Membranes of the *Amnios* are found weak and tender, and that they break them, the Twins rest or bear immediately upon one another, they stick close because of the extream Softness of their Bodies, and being thus join'd, they are pushed out at the Birth together, as monstrous.

We observe, that the *Chorion* and *Amnios* are generated in the *Ovaries* from the Seed, and that they encrease and stretch themselves more and more by their Nutrition; that these two Membranes, which at first Sight are remote, or at some Distance from one another, occasioned by a small Quantity of Liquor contained betwixt them, as we may see in a *Fœtus* of six Weeks or two Months old, which proceeds from the Thickening of

it, that fills the whole Space, and joins it self so strictly one Part to the other, that it is difficult to separate them: So that all that the Ancients or others have said of the Sweat or Urine that is found in these Inclosures are Errors, which do not deserve refuting. For since the two Membranes touch each other, Where can these Liquors be contained? And if we see any Thing run out in opening these Membranes, it is when the *Amnios* is opened.

As for the Liquor that may flow sometimes a few Days before the Delivery, we observe that it does not proceed from the *Amnios*, since we always find a Quantity contained in that Covering, but that it comes from the Waters that are collected betwixt the *Amnios* and the *Chorion* when these two Membranes are divided; for the Fibres of the *Chorion* are not so relaxed, that they admit their Pores so open as to give Passage to the Humidity that is by Degrees collected in the Opening betwixt the two Membranes; but when either of them are torn off, the Water freely flows out.

The Ancients believed that the Liquor of the *Amnios* was an Excrement, and that it was the Sweat and Urine of the *Fetus*; but the Moderns have shewn, that this Humour is prepared for the Nutrition of the *Fetus* by the Mouth. *Harvey* hath proved it by many Experiments. He makes it appear, that this Liquor of the *Amnios* is composed of serous Particles, and others that are Chylous and spirituous, the last of which serve for Nourishment to the *Fetus*. This Opinion is very reasonable, for in the last Months of Gravitation, this Liquor is almost dried up. It is sweet, and of an agreeable Taste, which shews it to be no Excrement. If it be set over the Fire, it will thicken into a Jelly, which it would not do, if it came from Urine.

But the greatest Difficulty consists in determining from whence this Liquor comes. Some will have it, that it comes from the *Matrix*; some, that it runs cross the Membranes, and is collected in their Cavities; and others will have it come by the small Branches of the umbilical Arteries that run through the inward Part of the *Amnios*: Others again say, that it arises from the Sweat of the *Fetus*. In short, there are some,

as *Harvey*, *Drelincourt*, and other Moderns, propose an Opinion more agreeable to Reason, and founded on Experience. 'Tis a Thing known to every old Woman, say they, that Children, when they are new born, have their Breasts always full of Milk; so that it is sometimes so plentiful, they are obliged to press it out, lest without this Precaution the Breast should harden, and then suppurate, as the Breasts of Nurses do when the Milk is coagulated therein. The Liquor of the *Amnios* then is that serous Milk which runs from the Infants Breasts; for how should they be so full of Milk, if they had not met with it in the *Amnios*. This Liquor continues to be filtered through the Glands of the Breast, during the Time that their Texture is so relaxed as to give Passage to it; but afterwards, when they are lock'd up or closed so that they cannot filter any more, this proceeds from the *Serum*, that is incapable to serve for any further Nourishment for the *Fetus*. So in the last Months we find the Liquor of the *Amnios* clear as common Water, that if it be put over the Fire will not thicken into a Jelly, because it has lost all those nutritious Particles whereof we spoke.

The Membranes that cover the *Fetus* being laid bare, the Navel-string presently appears to View. The *Latins* call it *Umbilicus*, derived from the Word *Umbo* a Bunch, or the Eminence or Rising in the Middle of the Girdle, because it is seated in the Midst of the lower Belly, where it is the Centre. 'Tis a membranous, crooked and uneven Pipe, of the Length of an Ell or thereabouts, and of the Size of ones Finger, which springs from the Middle of the *Abdomen* of the *Fetus* to the *Placenta*. 'Tis necessary it should be thus long, that the Child might float in the Womb, and have the Advantage of Motion in its several Circumvolutions or Turnings.

The *Navel-string* usually turns back towards the Breast, and leans to the Left Side. It stretches from Head to Foot, and from thence advances to the *Placenta*, where it is join'd by the Vessels and Membranes which it contains. Sometimes towards the Right Side it mounts to the Neck, twists round it, and then descends again to the *Placenta*. It is made up of Vessels, and a small Pipe called

led the Small Gut. The Vessels are named *Umbilical*. Those that proceed from the *Fœtus* are four; one Vein, two Arteries, and the *Urachus*. The Vein is larger than the Arteries. It takes its Rise from the Liver of the *Fœtus*, from the Fissure of which is afterwards formed the Origine of the *Vena Porta*, whereof it is a Sprig, and from that passing cross from the Navel, it goes by the small Intestines to the *Placenta*, into which it is inserted, and implants it self by an Infinity of Roots. This Vein carries the Blood to the *Fœtus*, which is prepared in the *Placenta*, and it has several *Valves* which are open towards the *Fœtus*, and sustain the great Efflux of Blood, hindering its Return into the *Placenta*. The *Umbilical Arteries* are two, which take their Origine from the interior Iliack Branches of the *Aorta*, or great Artery, immediately from the Beginning of its Divariation, from whence it is carried upwards towards the Sides of the Bladder, and having met with the Vein that accompanies it, they enter together into the small umbilical Intestine. It is by these Arteries that the Blood and vital Spirits are carried from the *Fœtus* to the *Placenta* by the Impulsion of the Heart of the *Fœtus*, in order to dissolve, and still more rarefy, after a peculiar Manner, the Blood which is brought by the small Vessels from the *Matrix*, in order to its acquiring a greater Perfection.

A Modern Author explains the Use of the umbilical Vessels after this Manner: The Arteries of the Mother, says he, carry a certain Quantity of Blood into the *Placenta*, which being there lodged, is received by the Branches of the umbilical Vein, which conducts it into the *Vena Porta*, to be filtered through the Substance of the Liver of the Infant before that it enters into the *Vena Cava*, which carries it into the Right Ventricle, from whence it passes into the Left by the *Foramen Ovale*, afterwards to be distributed to all the Parts of the Body by the Arteries. The Superfluity of this Blood is brought back by the two umbilical Arteries, where being diffused, it is received by the Veins of the Mother, which are spread abroad, and carry it back into the large Veins, to circulate with the whole Mals; and so it is made one continued Circulation from the Mother to

the Infant, and from the Infant to the Mother. One certain Sign that it is done this Way is this, that in touching the *String* of the Infant new born, we may perceive the same Pulsation as from the Arteries, which makes it appear that the Blood that fills the umbilical Arteries is the same that comes from the Heart of the Infant, and not that of the Mother, as was believed some Time ago.

To these three umbilical Vessels we may add the *Lacteals*, by which the Milky Liquor or Chyle is conveyed from the Cells of the *Matrix* into the Capacity of the *Amnios*. The *Urachus* or Urinary Vessel is the next that belongs to this Part: It is a small, thin, membranous, long and round Body, having a little Opening or narrow Passage, and rises from the Bottom of the Bladder, betwixt the Artery and the Vein, to the very Navel. *Avicen* and *Fabricius ab Aquapendente* say, that the *Urachus* does not end at the Navel, but that, conjointly with the Vein and the umbilical Arteries, it passes along with it, to wit, even to the Membranes that inclose the *Fœtus*; that in Brutes it opens into the *Allantoides*, and in Men enters the *Chorion* and the Urinary Membrane, and that it carries the Urine thence into the Bladder of the *Fœtus*.

The Ancients believed that the *Urachus* served as a Pipe to evacuate the Urine of the Infant into the Membranes; but the Moderns, who have found no Hollow therein, cannot believe it hath any such Use. Besides these Trials, Reason will convince us that the Infant does not urine in the Mothers Belly, since the Chyle that is brought to it with the Blood, for its Nutrition, is purified before it comes there; and besides we have found other Reasons, from the Serosity in which the *Fœtus* swims, without searching into the Urine. But the true Use assign'd to the *Urachus* is, to suspend or hold up the Bottom of the Bladder, and hinder it from descending or falling upon the Neck, in order to make it capable of holding a great Quantity of Urine.

The umbilical Vessels, for greater Security, are wrapped about with a Covering called the *Small Gut*, or the *Cord*. This Twist or String is a membranous, long, round, hollow

Part, moderately thick, composed of a double Coat, that covers and unites together the umbilical Vessels, with which it is twisted like a Cord. We find in the Cavity of this a certain Milky Humour, which it draws from the small Cells of the *Matrix*, and from whence afterwards it descends by Degrees into the *Amnios*. This Liquor, after the *Fœtus* is born, flows from the Womb usually thick, and like Jelly, if set in the cold Air. There are in several Parts of it Knots almost like little Bladders or Blisters, filled with a whitish Juice. *Wharton* believed, with Reason, that these Knots were like little Nipples, by which the lacteal Juice was drawn into the Capacity of the *Navel string*, and afterwards distill'd into the Cavity of the *Amnios*. Superstitious old Women used to predict the Number of Children from the Number of Knots on the String; and if there were few or none, that then the Woman would have no more: So likewise, according to the Distance of the Knots, they used to reckon the Distance of Time before the Mother would bring forth another Child.

The *Fœtus* having stayed nine Months in the Womb, it breaks its Prison, to take the Benefit of the Air, which it so much wants; and then, by the Care of the Mother, and the Strength of its Constitution, it encreases daily by Feeding. It may be asked, Why an Infant cannot remain longer in the Womb than nine Months? We answer, Because it wants a greater Quantity of Air to

make the Blood circulate than it receives from the Mother; and that the Lungs and Heart increasing so considerably, endeavour to enlarge their Motion, which being stronger, and more vigorous, brings the Patient into Labour, and sometimes the Infant is so strong as to exclude it self without much, if any, Pain to the Mother. *Mr. Drelincourt*, a very able Anatomist, is of quite another Opinion. He says, that the Child having never breathed in the Mother's Womb, is not capable of forming any Desire thereof: Besides, by comparing the Lungs of a *Fœtus* who died before the Birth with one that lived some Hours after, he assures us, that he found the first of a livid Colour, and so loaded with serous Matter, that it sunk to the Bottom of the Water like a Stone. Instead of that, the other's was of a lively Colour, and so light, that throwing it into Water, it would rise again presently: And thus, says he, we may discover the Wickedness of those who strangle their Children in the Birth, and say, to avoid the Punishment of the Law, that it came dead into the World. Thus most Anatomists now conclude, that the Infant struggles not to come into the World for fresh Air; but rather, that he is disturbed by the Thickness and Acrimony of the *Serum* in the Womb, that raises Gripes in the poor Infant; and that this Access of Cholick Pains affects the *Matrix* of the Mother; so that both being afflicted, they join together their utmost Efforts to be parted:

Of the Diseases subject to the Parts of Generation in Women, and first of those of the Womb. From Monsieur St. Hilaire, &c.

THE Diseases of the Womb are divided into such as happen to the *Vagina* or Neck of the *Matrix*, *Tenigo*, the fleshy Excrecencies, the Straitness or Contraction, the Descent or Falling down,

Pustules, Condilomes, Hemorrhoides, Ulcers, Rhagades, and Warts. Those which attend the Lips of the Natural Parts are, Caruncles, Itching of the *Vulva*, and the Tumor of the Lips; and such as happen to the

Matrix

Matrix it self, as Intemperance, Wind, Dropsy, Inflammation, *Scirrhus*, falling down, *Sphacelus*, Wounds and Ulcers. The symptomatick Diseases of the Womb are, Suppression and excessive Fluxes of the *Menses*, an Uterine Flux, the *Gonorrhœa*, pale coloured Fluxes, Suffocation of the Womb, *Furor Uterinus*, Barrenness, the Mole, a depraved or vicious Conformation of the *Fœtus*, Monsters, Abortion, dead Child in the Womb, and difficult Birth.

The *Tenigo* is an Inflammation of the *Clioris*, caused by abundance of Spirits and Blood which are convey'd to that Part, and which distend it so, that Women have a Desire to make Use of it. When this Indisposition is without Pleasure, it is called a Priapism, and Salaciousness when with Pleasure. In this Disease, the *Clioris* grows large, and is swelled up, and erects like a Yard, and is sometimes so long, that it enters the *Vulva*. This Inconvenience is not dangerous, but it is leud and wicked.

The carnosus or fleshy Excrecencies of the *Vagina* are called Tails, because they proceed sometimes out of the Parts hanging down like Tails. They are occasioned by abundance of *Lympha* and nutritious Juice, which make Obstructions in the internal Membrane of the *Vagina*; so that the Fibres of that are always receiving new Nourishment, by which Means they grow and extend themselves considerably, in covering sometimes all the *Vagina*. There are some Women more subject to these Excrecencies, because the Vessels of the *Vagina* are very large, from whence it comes that they are easily dilated by the Plenty of nutritious Juice. These Excrecencies are soon known, because they fill a Part of the *Vagina*, and therefore the Women are sensible of their Growing. They are more deformed and inconvenient than dangerous.

The Narrowness of the Neck of the Womb may proceed from several Causes; for either it may come from the Birth, a Stone in the Bladder may compress it, or a Tumor in the *Rectum*. In short, from the *Carnosities* and the *Fungus* that may stop the Mouth. When the Straitness or Contraction is entire, there happens a Suppression of the *Menses*, they perceive a weighty Pain, sometimes the Urine is suppress'd, and sometimes

it causes a *Strangury* and a *Dysury*: In short, it is easily known by examining the Part. The Straitness that comes from the first Conformation of the Part is not to be cured. If the Passage of Urine is likewise stop'd; we must proceed to Operation.

The Descent of the Womb is nothing but an Extension or Lengthening out of the *Vagina*, when it hangs below the Lips. It happens sometimes after Labour by the Ignorance of the Midwife, who catches hold of the Foldings of the *Vagina*, mistaking it for the After-Birth: This makes it that the Neck of the Womb separates from the Parts to which it adhered, so that you perceive it hang out of the Body. It happens sometimes in Girls, either by an Inflammation, or a Relaxation of the Foldings of the Membrane of the *Vagina*, which always proceed from Obstructions; or rather, it may come from Ulcerations, which efface and wear off the Wrinkles of the *Vagina*.

If the Tumor is fixed on the Lips of the *Vulva*, or near, we call it only a *Descent*. It does not appear when there is a small Tumor that is upon the Lips, or a heavy Body of the Size of an Egg. If the Tumor is outwardly, it is properly that which we call a Falling down: It is bigger or less, and leaves a Hole in the Middle, which the Ancients mistook for the internal Orifice of the Womb. When all the Neck of the *Matrix* is relaxed, sometimes there is no Hole, and the Tumor is only round, and then there is nothing but some Wrinkles from the Neck of the Womb, which may be restored. They perceive at the Beginning a Pain, with tension towards the Loins, and Hypogastricks, occasioned by the Weight that lies violently on the Parts. Sometimes the Fever succeeds, sometimes Convulsions; sometimes the Substance that descends is corrupted, ulcerates, and sometimes gangrenes.

The true Descent of the Womb, produced by some external Violence, is almost always incurable; for this Violence happens not, without breaking and rending the large Ligaments, the Consolidating and artificial Reunion of which is not very probable. A fresh Descent of the *Pudenda* only, and proceeding no further, is easy to cure, especially in young People; but if the Malady is inveterate, if the Air hath considerably alter'd

ter'd the Substance, if the Patient is aged, it is very difficult to effect. It is rare that the Falling down of the Neck of the Womb is mortal; it is only dangerous by the Ulcers, and the Stench that succeeds. The Fever, the Pain, Convulsion, and other the like cruel Symptoms that happen, make it mortal.

Pustules at the Neck of the Womb are small Tubercles or Risings in the Flesh, that come from Pain and Itching; and the *Condylomes* are other Sort of Tubercles in the Shape of Knots. These Tumours are attended with a burning Heat, that gives a great deal of Pain. The *Pustules* are always caused by an acrid and vitious *Lympha*, especially when the Matter that is separated by the Vaginal Glands is become acrid and acid. The *Condylomes* are occasioned by the Obstruction of the Vaginal Glands, or by the Wrinkles of *Vagina*. These Indispositions are common in Venereal Cases: They are then attended with Inflammation, with Pain, with Heat and Hardness. There are others that are soft and without Inflammation, and which have a great deal more Affinity to the Evil.

The *Hæmorrhoides* of the *Vagina* proceed from small bloated Tumours, that arise from Pain: They make the Women look pale, and cause a Lassitude: They have some Analogy to the *Hæmorrhoides* of the *Anus*. There are those which bleed, and those which do not; sometimes they are attended with the Whites. These Disorders are produced, like those of the *Anus*, by a thick coagulated Blood, from an Acid which rests in the Vessels of the *Vagina* dilating them; and in the End, the Blood ferments, becomes acrid and corrosive, tears the Vessels asunder, and at last causes an *Hæmorrhage*. The *Hæmorrhoides* of the *Vagina*, that come from Blood, are much easier cured than those that do not run at all.

The *Ulcers* of the *Vagina* proceed either from an external or an internal Cause: Sometimes it is from taking of Medicines, but rather from a difficult and tedious Delivery, that occasions these Ulcers. The internal Causes are, the *After-burthen* gangrened, the Cleansings stop'd, the Pox, Abscesses; in short, all Sorts of Obstructions caus'd by an acrid *Lympha* are capable of forming Ulcers. These are known from their Pain and their

Itching, and the *Pus* that flows, which is sometimes mixed with Blood, particularly in the Monthly Purgations; in making Urine, they perceive acute Pain. If the *Urethra* is likewise ulcered, there is a great Heat of Urine, there succeeds a slow Fever, with Shiverings. The *Ulcers* of the *Vagina* are not to be neglected, because the nutritious Liquors grow sharp by their Stay, and so become acrid and corrosive like *Aqua fortis*; all the Fibres being cut, the Part is deprived of its Nourishment, and is subject to gangrene. It is very difficult to cure the inveterate Ulcers that lie deep in the *Vagina*, especially if joined with the Pox and the *Scurvy*.

The *Fistula's* of the *Vagina* commonly succeed obstinate Ulcers: They are known by the same Signs as others, from their Callosity, and a stinking *Sanies* that flows from these *Fistules*. Sometimes they penetrate into the Bladder, and sometimes into the *Anus*.

The *Rhyades* or Chaps are from small Ulcers that break the Wrinkles or Folds of the *Vagina*, and proceed sometimes from a difficult Labour, which occasions a Dilaceration of the Part; or else they come from rubbing too roughly upon the Lips, or from Excoriation of sharp Humours, or by Inflammations, Warts, or *Condylomes*.

The *Warts* come upon the Lips and in the *Vagina*, which do not differ from those of the *Glans* and the *Prepuce* in Men. They are produced by an acrid *Lympha* lock'd up in the Glands of the *Vagina*: These Warts are sometimes hard and callous. The *Condylomes* and *Warts*, which are before in the Neck of the *Matrix*, are very troublesome to cure; it is much easier to remove those that are external: They likewise create great Uneasiness when occasioned by the Pox. Besides, they are hard to cure in Women who have a Stoppage of their Terms, where they are full of Humours, or scorbutick; because the Blood is devoid of volatile, and the Fluids are all thick, glemey and acid.

Caruncles and *Excrescencies* of Flesh come sometimes upon the *Labia*, and sometimes in the very *Vulva*, where they fix with a great many small Roots, that it is no easy Matter to extirpate them. They proceed from the Acrimony of Juices, which coagulate in the Glands,

Glands, and then being extravasated, occasion these Excrefcencies of Flesh. These *Caruncles* are discover'd by examining the Part, or by the Relation of the Patient. Sometimes they are fungous, and cause great Inconveniency to the Approach of the Parts and the Flux of the Courses; from whence arise ill Symptoms, especially if the Caruncles are large; because they compress the *Urethra*, and cause a Suppression of Urine.

The Itching of the *Vulva* is very sensible, from a pricking Pain therein, which occasions the Woman to scratch immoderately, as if she was afflicted with that Itch called the *Pruritus*: If it lasts long, there sometimes happen an Inflammation and a Fever. This Itching is caus'd by the acrid and volatile Salts, mixed with alkaline Particles, that ferment together in the Contexture of the *Vulva*. It is this light Fermentation that agitates the nervous Fibres, and that presently raises this soft Pleasure; but when the Liquors are full of more rigid saline Particles, the Itching becomes insupportable, especially in the Night, when the Body is warm, and the Pores open. It is observable, that old Women are more subject to these Itchings than young ones; because their Blood is much fuller of fixed Salts, since their natural Courses have left them, and that their Blood is less pure. It is for this Reason that it is more apt to stop in the Glands of those Parts: And perhaps they are these Itchings and Titillations that make Women who are past the usual Course of Nature more wanton than before. The Itching of the *Vulva* has nothing dangerous in it; but it is very troublesome, because it hinders the Night's Rest, by reason the acrid Salts ferment and fret the Pores of the Skin as they pass thro' them, being raised to the Surface by the Heat of the Bed. If this Itching comes not from a Venereal Cause, but is a natural Production of the Humours, the best Remedy for it is Enjoyment, or the Act of Venery.

The Tumour of the Lips may come from a Contusion, which may stop the nutritious Liquors; or from their Acidity, which remains in the cutaneous Glands of the Lips. These Obstructions put a Check to the Fluids that should come to the Part: It is form'd from gross Tumours that are common to Women afflicted with the Pox, because the

Blood of pocky Patients is full of acrid and fretting Salts, that coagulate the *Lympha* in the Glands. This Tumour is easy to know. That which comes from a Contusion, or some other external Cause, is sooner cured than that from a Pox: That which is hard and scirrhus'd is difficult to cure.

The Inflammation of the *Matrix* is an Obstruction very like the rest, occasioned by the Acidity of the nutritious Juices. This Disease is perceiv'd by the Pains in the Groin and the Breasts, by the continued Fever, by the *Nausea* and Vomiting, by the Suppression of the *Menses*, Urine, Excrement, by insupportable Thirst, Fainting and Coldness of the extreme Parts, by the *Delirium* and Convulsions that happen sometimes; in short, by the Tumour in the *Hypogastrium*, in which the Patient perceives a burning Heat, with a Tension, Weight, and a vast Pulsation, which increases when you touch it; and when you compress it, it yeilds a little. If the Inflammation changes into *Pus*, all the Symptoms increase, and diminish when the Suppuration is made: If it determines or goes off by Resolving Medicines, the Accidents as well as the Tumour decrease by Degrees.

This Disease is very dangerous, especially if attended with ugly Accidents, and the Gangrene, and if it happens during Gravitation. It is less dangerous when it goes off by Resolution, and we may observe when it suppurates: It is to be wish'd that the Abscess would open towards the Cavity of the *Uterus*, that the *Pus* might have a free Passage, and then the Patient might be well cured from the Inflammation.

The *Sphacelus* of the Womb sometimes succeeds the Inflammation. It is an entire Obstruction of all the Vessels of that Part, so that the Circulation is totally interrupted, and the Part necessarily suffers a Mortification. This Disease is attended with a strong Fever, and a Pain much like what we feel in the Stone in the Kidneys, *Deliriums*, Convulsions, particularly when the Infant is dead in the Womb and corrupted; in fine, we observe the Part becomes black, soft, stinking, naked of Hair, and without Sense.

The *Scirrhus* of the Womb is nothing else but a Tumour harden'd in the Glands and Vessels of the Part. It is advantageous to make

make use of cold astringent Medicines in an Inflammation of the *Matrix* before it comes to a *Scirrhus*. This Disease is usually known by a large hard Tumour, and without Pain, from the left Side of the Navel. In some Women the Belly is swell'd as if they were with Child, which proceeds from a Dilatation of the Womb. We may distinguish the *Scirrhus* from the *Mole*, in that the *Menses* flow disorderly in the *Mole*, if they are not suppress'd, and the Breasts swell with Milk. Instead of that, in the *Scirrhus* the Purgations are regular, and the Breasts become dry and sink away. This Malady is very dangerous, and easily degenerates into a *Cancer*, especially if the Body is *Cachymick*.

Ulcers of the Womb commonly succeed an Inflammation that is suppurated: They yield a foetid Matter: We are sensible of great Pains from the *Hypogastrium*: Sometimes they come from Convulsions; and if the *Sphacelus* meets it from the Womb, it will stretch sometimes to the very outward Parts.

We may know the *Matrix* is wounded, when the Pain is communicated to the Groins and the Thighs, because of the Ligaments, and the Connexion that there is with the *Pelitonacum*; when the Blood flows at the Wound and by the Privy Parts, when it is follow'd by Vomiting of Bile, when it is Pain to them to speak and they faint away, and when they are tormented with Pains in the Head and Eyes, from the great Sympathy there is with the Brain. This Wound is very dangerous, particularly in the last Months of the Burthen, wherein the *Matrix* is all spongy, and full of nutritious Juice, and the Vessels loaded with Blood.

The *Inflation of the Womb* or windy *Mole* comes from the Air being pent up in that Cavity, which swells or blows it up after a surprizing Manner; so that not only the Belly rises by Degrees, but the Monthly Courses stop at the same Time, or else flow but very little, and sometimes Milk is found in the Breasts, which easily imposes on Women, and then they firmly believe they are with Child, without suffering themselves to be undeceived by the Length of the Time, that lasts a Year, and sometimes two. In the End, they are deliver'd of some Wind,

that goes off with Noise, the Belly falls, and then they know the Impostor; but the Women are surpriz'd very much at what is become of their Belly. The most common Cause of this Swelling, according to *Etmuller*, is the Reception of the external Air in the Womb after Delivery or a Miscarriage, when the Women at that Time are too much exposed to the Air, without guarding the Genital Parts; or when (during the Abortion or Delivery) the cold Air introduces it self into the Womb, it swells so strongly, that the Patient appears to be with Child again. If the Suppression of her *Cleanings* happen at the same Time too, they create cruel Pains throughout the *Abdomen*. This Swelling of the *Matrix* rarely happens from any internal Cause.

The *Dropsy of the Womb* is an aqueous Tumour, that deceives Women, and makes them believe they are with Child. We shall distinguish the watry *Mole* of the *Matrix* into that which is rare, and that which is more common. That in the former, the *Matrix* is puff'd up by a Quantity of clear Waters, and sometimes yellow, collected together in that Cavity; and that the last is an aqueous Liquor, a little viscus, that is inclosed in a proper Membrane, which is often alone, and sometimes many in Number, that are shown in the little Bladders (that are bigger or less) which the Patient casts out, from whence it is call'd the *Bladder Dropsy of the Womb*. This last is of the Kind of *Moles*, and may be defined a True Conception, and the Generation of an Egg, which is found depraved, and the Conformation destroy'd from the nutritious Juice which is brought to it to form and nourish the *Fetus*, which Juice, after its Reception into some one of the Membranes, is collected into several distinct Vesicles or small Bladders, that represent this watry *Mole*, whereof we shall speak hereafter.

The Causes of the *Dropsy* proper to the Womb, or of the Waters collected in that Cavity, are several in Number. Sometimes the *Dropsy* is joined with the *Embryo*, according to the Observations of *Hildanus* and *Salmuthius*; and the Origine of this *Dropsy* is the abounding of a clear, whitish and milky Liquor, but too watry for that Kind of Juice which should be filtred in the Womb

Womb for the Nutrition of the *Fetus*; which Liquor, being gather'd together into a large Quantity, not only is the Cause that the Mother cannot feel the Child stir; but by breaking the external Membrane in which it is contain'd, it sometimes flows into the Birth some Months before Delivery, without incommoding the *Fetus*.

If these Waters make their Way before the Birth, and run slowly, so that the Physician who is called in should imagine it to be an *Abortion*, he ought to refresh and encourage the Mother by Cordials and Analepticks, before any Thing be undertaken rashly. Indeed the *Dropfy* of the *Womb* is generated by the Suppression of the *Lochia*, whether whole or in part, and when the Blood flows; but there remains a serous Matter and a Kind of Milk which should follow. This Liquor is the Occasion of Wind rising from the Fermentation which it makes, and the Inflation of the *Matrix* is found join'd to the *Dropfy*. Then the Courses flow regularly, notwithstanding the Tumour of the *Womb* and the *Abdomen* which remains; the Patients conceive and breed anew, and destroy in the last Birth a prodigious Quantity of *Lochia*: Sometimes the suppress'd Matter of the *Lochia* throws it self upon some other Part, where it is collected together, according to the Observation of *Esmuller*. In short, the Waters are collected after the same Manner in the *Matrix*, and swell, which either happens by a long Suppression of the *Menses*, or by a Return of the *Lympha* that is suppress'd, or by some internal Vice. Of this Kind are the *Dropfies* of the *Tubes* of the *Womb* and that of the *Abdomen*, which succeeds the Suppression of the *Menses*, where the Matter is collected in the Duplication of the *Peritonaeum*, agreeable to the Observation of *Tulpius*, &c.

The Signs of the *Dropfy* of the *Matrix* are, the Tumour that possesses the *Hypogastrium*, the Fluctuation when we press the Tumour, or when the Patient moves; the Indolence in the Pressure of the Tumour, the Weight of the *Vulva* or the Passage of the *Pudenda*, the Change of the Situation of the Tumour when the Sick change Sides in Bed. This Disease is not dangerous, when the Humours that produce it are not as yet corrupted, and that in discharging them, some Ex-

cretion like that of the *Menses* is found out; but if the Humour, by long standing, comes to be corrupted, and acquires an acrid pungent Quality, the Disease is then attended with several mischievous Symptoms, and ends in Death.

When the Women become capable of Generation, they are subject to a great many Alterations and Changes as well as Men; the latter of which as they come to elaborate Seed, so the former generate something analogous thereto in their *Testicles* and the *Womb*. When they enter into their Puberty, besides the Hair that covers the Mount of *Venus*, the Breasts that rise and swell, they undergo a particular and proper Change, to wit, by the Evacuation of Blood through the Parts of Generation, which we call *Menses* from their regular and periodical Monthly Course. We have said, that this Evacuation was proper and particular to Women, because there are no other Sorts of Animals that are subject to it. There are some Examples, but those very few, of Men who lose Blood regularly once a Month by the Yard, as Experience demonstrates; and there are several who have a regular Course of *Hemorrhoides* instead of the *Menstrua*. The Women have their Courses generally forsake them about 48 or 50 Years of Age; but often meet with a regular Flux of *Hemorrhoides*, to supply the Suppression of the *Menses*, and seldom or never fail to have the *Fluxor albus* in some Degree or other.

The *Menses* begin at the Time of Puberty, when the Women become capable of Generation, that is to say, at 14 Years of Age, which is twice seven, and end at 48 or 49, which is seven times seven, Nature regulating her critical Motions from seven to seven. There are Women which are in their Puberty and regular at 10 and 12 Years old; but these Examples are rare, and do not alter the ordinary Course of Nature. That which *Platerus* says in his Observations is pretty surprizing: It is of a Woman who had her Purgations very regularly being a Maid; but when she was married, they stop'd without any Prejudice to her Health.

The *Menstrua* or periodical *Flux* are caused by an extraordinary Fermentation, produced in the Mass of Blood by a spirituous *Leven* received from the *Testicles* and the *Matrix*,

and collected in a due Quantity, which makes the Blood swell, distends the Vessels, and makes the Circulation quicker; from whence it follows that there are Pains in the Loins with Tension, and a Pulsation of the Arteries in those Parts and about the *Os Sacrum*, till at last the Blood makes its Way by the Lymphatick Vessels, which open themselves into the Neck of the Womb, wherein they have their Insertion; for nothing flows by the Womb it self. When the Blood is sufficiently evacuated, the Swelling and Effervescence of the Blood stop, and the Vessels contract themselves till a new Fermentation succeeds.

The extraordinary Fermentation at the Time of the *Menses* is demonstrated by the Smell of the ordinary *Leven*, which being carried to the Nose, advances the periodical Flux; by a Piece of *Leven*, that being taken of the Size of a small Nut or Nutmeg, raises the Terms; by the Perception of the Fever which Women have at those Times. And *Lindanus* hath observed a Menstrual Fever that lasted two Days every Month. In short, by every Thing that stops the Menstrual Flux, which operates not but in obstructing or retarding the Fermentation.

This periodical Evacuation, according to *Etmuller*, is injured three Ways: 1. By lessening or an entire Suppression of it; 2. By increasing of it, when in too great Plenty; 3. By depraving it, when the Flux is not natural, and when it is attended with several Symptoms. We call it a Suppression of *Menses*, when they run too little, or not at all. It is unnatural, by reason of Age, as after Fifty; by reason of their Condition, as in Teeming Women; in some Nurses, who commonly have no Purgations; in the State of Health after some considerable Sickness, wherein the Mass of Blood is impoverished by the Want of volatile Spirits, and incapable to receive this Fermentation. It is equally unnatural to such who have some other Evacuation, either from Blood directly, or under the Form of a *Sanies* and Gleet from inveterate Ulcers. *Bartholin* writes, that he knew a Suppression of the Terms cease presently from the sealing up some Abscess in the Patient. We ought to leave these Things to Nature, and prescribe no Sort of Physick to these Kind of Women.

That which is remarkable is, that these Sorts of Ulcers which occasion a Suppression of the *Menses* suffer from great Alterations, and are constantly worse at those Times when the *Menstrua* should flow; which is known by the Pain, Redness, Inflammation, and *Pus*, which runs more abundantly during the Days appointed for the periodical Purgations; after which, the Symptoms stop all at once, until the Return of the next Month.

The Causes of the Suppression of the *Menses* contrary to Nature are, according to *Etmuller*, either from the Blood, or the *Matrix*; from the latter, when the Vessels that terminate at the Neck of the Womb are stop'd, bound together, or vitiated and injured, by Wounds, Ulcers, or some other Reason; from the Blood, when its Crudity, Viscidity, or some other Disorder, renders it incapable of receiving its Fermentation, and that Swell required in it. Among these Causes, as to the Non-naturals, it is too excessive Cold that some how or another happens; likewise cold Air taken in at the Womb during the Time of the Flux, the Immersion of the Body in cold Water, the sudden Coldness of the Feet, and that of the Stomach: Drinking cold Liquors, which coagulate the Blood suddenly, stops the Fermentation and Course of the Flux.

Raw viscous Food, and hard Digestion, contribute very much to this Suppression; so hot Bread and Milk is very detrimental to young Girls at this Time, because they hinder the Fermentation by their Viscidity, and make Way for the Suppression. All the *Acids*, especially the fix'd Minerals, as Vitriol, Salt of Nitre, and the like, put a Check to the *Menstrua*, by thickening the Blood, and retarding the Fermentation, which depends on volatile Principles. This Suppression, and the Disease called the *Maiden* or the *White Fever*, commonly succeeds when the Digestion of the Stomach, being vitiated by the ill Food, presently generates bad Chyle; so that this *Cacochymy* is follow'd afterwards by the *Cachexy*; wherefore *Barbette* had Reason to say, that the Cause of the Suppression was seated in the Stomach. It is for this Reason, that all those who are thus afflicted increase their Disease by eating of strange extraordinary and ridiculous Sorts of Things,

as Tabacco, Ashes, Pipes, Gravel, Cinders, &c. In short, the Passions of the Mind bear a great Share in this Disease; for as Joy and moderate Anger increase the Fermentation of the Blood, and the Menstrual Flux; so Terror, Sadness, and Fear, make dangerous Suppressions. We know that an Hemorrhage of the Nose hath been stopped sometimes by a Fear or Dread upon the Patient. Among the internal Causes, the chief is the Cachexy, and the Crudity of the Mass of Blood, caused thro' a Fault in the first Digestion; for a crude Chyle not well volatilized mixing it self with the Blood, renders it incapable of Fermentation.

The Suppression of the *Menses* is known by the Relation of the Sick, and the Symptoms which attend it. As to Maidens, their Blood stops suddenly here and there in their Veins, and they purge or evacuate often by extraordinary Places. The Tincture of their Skin changes, they are pale and wan, bloated, and of a livid Colour in their Cheeks. As to the married Women, they are affected with Pain at the Stomach, a depraved Appetite, Disrelish of Victuals, have a Nauseating and Tendency to Puke, which sometimes happens to Maids, but more rare, they being more subject to the Cachexy.

As this Inconvenience sometimes attends Breeding Women, which is often concealed by an Excuse of Ignorance, or by a base Disimulation in the Women, it is necessary, to prevent Errors in the administering Physick, to know how to distinguish a simple Suppression of the Courses from such a one as proceeds from Gravitation. In the first Place, those who are with Child are commonly of a fresh or wholesom Complexion, and their Humours brisk and gay; but the others, who are affected with a diseased or sickly Suppression, are constantly pale, and appear melancholy or sad. In the next Place, the third or fourth Month, together with the Motion and Situation of the *Fetus*, makes a Discovery that the Woman is with Child: To which we may add the Opening of the inward Orifice of the Womb, which is firmly closed in such as are not really with Child. As for the Milk in the Breasts, *Hippocrates* is of Opinion that may happen upon a Suppression of the *Menses*; but the Matter seems rather to bear a Resemblance

to Milk, than to be really Milk it self. *Etmuller* makes the following Differences betwixt the Suppression of the Courses and Breeding: 1. Those who have a Suppression contrary to Nature are pale, not only in the Face, but throughout the whole Body. 2. The Loathing of the Stomach in Breeding Women does not often exceed 3 or 4 Months, if it lasts longer, it comes from a Suppression contrary to Nature. 3. The continual Pains of the Head shew the unnatural Suppression. 4. The Weight and constant Pullations of the Loins, and extraordinary Beatings of the Arteries or other Parts. 5. The frequent Changing of Colour, and the Alteration of Hot and Cold. 6. The painful Breathing upon the least Motion of the Body. 7. The frequent, uneven, slow, and sometimes almost lost Pulse, together with the Observation of the gradual Rising or Swelling of the *Abdomen*, are certain Signs of Innocence.

The Suppression of the *Menstrua* is a mischievous Disease, and causes a great many Inconveniencies when it lasts long, as Tumors, Abscesses, Ulcers, Inflammations, Loss of Complexion, Fevers, Cachexia's, Dropsies, Loss of Appetite, Vomiting of Blood, Lipothimia, Phthisicks, Pains in the Head, Melancholy, Madness, and sometimes the Gout; and according as these Accidents are more or less in Number or Violence, the Malady is more or less dangerous; so that sometimes it procures Death after a tedious and painful Sickness.

An *immoderate Flux* of the *Menses* is a Disease opposite to the *Suppression*, in which the Menstrual Blood flows too plentifully. In the natural Flux, those who are young, and eat and drink high, have abundantly more of their Courses, and they last longer, than others who live more sparingly. Likewise we ought to distinguish this from the Weakness of the Force that occasions it, not from the Quantity of Blood. The Cause, agreeable to *Etmuller*, proceeds from the Blood that flows from the Vessels of the *Matrix* that contain it. It comes from the Blood: 1. When the Fermentation is too strong, that it swells excessively, and is consequently thrown in greater Quantities through the Vessels of the *Matrix*. Of this Kind is the violent Desire of enjoying the Man, that ordinarily produces in young Girls, and those

who have not been possess'd, excessive Floodings. 2. When the Blood is aqueous, too thin, and fluid: This is the Reason why fat, gross Women, full of serous Humours, are subject to this Disease, and the Blood which they are used to cast out is serous, watry, and like the Washings of Flesh. This is what particularly happens to such who have a bad Digestion, that use different Sorts of Liquors, and regard no Kind of *Regimen* or Method of living.

The Cause of an excessive Flux proceeds from the Vessels of the Womb, when they are opened by *Anastomoses*, or by some external Violence; when they are corroded by some acrid Remedies applied; that they are too much distended by a Miscarriage, or a difficult Labour, or some other extraordinary Motion of the Body, that may excite too large an *Hæmorrhage*. This immoderate Flux is known by the Weakness of the Patient: But when the Flux is extraordinary much without Loss of Strength, it is a Sign that Nature discharges or eases it self this Way, and that it is critical; but when we see a Woman weaken'd by it, we may say it is immoderate.

The Causes of this Flux are known by the following Signs: When there is a Heat and Ebullition of Blood, it is from these Inflammations and Ebullitions, the Eyes look red, the Veins are tumid, the Pulse large, swift and quick. When there is too great a Fluidity of Blood, the Nature of that is shewn; for the Blood is thin, and less proper to coagulate. If that the *Vulva* is too narrow or contracted, the Linen which receives the Flux is scarce stained, and but little Red upon it. As for the Acrimony of the Blood, that appears by the corrosive biting Pain that is upon the Parts of Generation. If the Flux lasts long, the Paleness or rather Wanness of the Face, Loss of Appetite and Strength, the *Syncope* or Fainting, Whites, Atrophy or Wasting, and a *Cachexia*, succeeds. The more obstinate this is, the more difficult it is to cure, and that not at all in Age, where it generally terminates with Life. When the Patient is cacochymick, and the Bile and Pancreatick Juice vitiated, they diffuse themselves more plentifully into the Intestines during the Fermentation, as it commonly happens, and there

they generate abundance of Wind in the Effervescence: Afterwards the Acid remaining Master, is carried into the Mesentery, where it raises Convulsions and other terrible wandering Pains, that last till the Blood is voided, and the menstrual Fermentation at an End; when these grievous Symptoms cease, and all is calm.

The Difficulty of the Courses is known by the Relation of the Patient. It terminates sometimes in a total Suppression, and those who are subject to it are used to fall into a Suffocation of the Womb. The too little Quantity of Menstrual Blood is almost from the same Cause with that of the Suppression, and we may principally accuse the too great Viscidity or *Lentor* of the Blood, which cannot produce a good Menstrual Fermentation.

The *Menstrual Flux Drop by Drop*, from its Affinity with the immoderate periodical One, does not differ, but as to more or less. In this the Blood flows continually, or it flows a long Time at each Period, not so readily as it is natural, but successively, and by Drops. The Reason, says *Estmuller*, is the Acrimony of the Blood, joined with the *Lentor*; and most commonly it is the Contraction or Straitning of the Vessels which is found join'd to a continual Irritation, that forces the Blood to issue out Drop by Drop. Likewise *Forestus* has observed a lasting Flux of this Nature, that degenerated into an Ulcer of the Womb in a cachectick Woman. In the Case where the Menstrual Blood is of an ill Colour, there flows with the Blood, a viscid whitish Mucous. The Menstrual Blood has naturally no Smell, but upon resting on the Part, or Stagnation, it will sometimes contract a fætid Odour, which is always bad and disagreeable to the Patient.

An irregular Menstrual Flux is, when the Courses observe no stated Time, but come sooner or later, without any Regard to a fixed Period. This is an Effect of the Texture of the vitiated Blood, which interrupts and hinders the Menstrual Fermentation, which recovers it self at one Time, and loses its Force at another. This Mischief ends at last in a total Suppression of the *Menses*, or a *Leucophlegmaria*. It happens sometimes that the *Menstrua* flow by Parts through which they ought not; at one Time

Time by the Gums, at other Times by the Navel, the Lips of the *Vulva*, the Corners of the Eyes, and sometimes by the Toes. Upon some certain Occasions, the *Menses* flow by the Mouth, in Vomiting or Spitting, and they have been known to issue out at a Wound. The Cause of this extraordinary Eruption is lodged in the Hypogastrick Vessels, which terminate at the Neck of the Womb; for the Blood flows not at all by the *Matrix* before the Birth, and therefore these Vessels are either naturally ill made, or too strait, or else obstructed by some Accident.

We call the *Uterine Flux*, or *Whites*, that by which there comes through the natural Parts a pituitous Humour, either thick and mucilaginous, or watry and serous, being sometimes acrid, saline and piquant, sometimes benign and sweet. It is ordinarily White, now and then Yellow, Green, or of some other Colour. It has no Smell, and very rarely stinks; when it does, it is when there is an Ulcer, from whence proceeds *Pus* that mixes with the *Whites*. It is observable, that Women and Maids of all Ages are subject to this Infirmary, and the Difference of the Colour of them happens equally to those that have, and those that have not their *Menses*. Old Women, when past their Courses, are subject to this Flux. Very young Girls are rarely afflicted, but Breeding Women are seldom free from it. This Indisposition hath no Regard to a periodical Course; sometimes indeed it is with it, and sometimes in the Intervals: The Flux notwithstanding is more in the Monthly Courses. This Flux, as *Etmuller* says, called the *Whites*, is that Liquor which exsudes or issues out from the Glands of the internal Orifice of the Womb; to wit, that seminal rarefied Matter which the Women emit or discharge in Coition, or some other serous Humour which is filtered by the Glands, and throws it self off from the Mass of Blood. The first Liquor makes the true Matter for the real *Gonorrhœa* in Women, which is like that of Men. The second Sort makes the Matter for the false *Gonorrhœa*, or the *Whites*, in Women. There is a Difference to be made in these two *Whites*, continues he. There is a slight Sort, where a little *Lympha* flows that is scarcely turned whitish, but is a little vis-

cous, without any considerable Inconvenience to the Body. This is then that true *Gonorrhœa* in which the internal Orifice of the Womb is only affected. Sometimes these *Flowers* are plentiful, constant, loaded with *Serum* of divers Colours, and run abundantly. The *Cachexia* or *Leucophlegmatia* throughout the Body is found join'd together with the Swelling of the Feet, a Laziness and Numbness of the Hands and Legs, and other the like Symptoms. That which is the false *Gonorrhœa* proceeds from a *Cachexia* or ill Habit of the whole Body. *Hennius* distinguishes exactly these two Sorts of *Whites*. He calls the first *Uterine*, since they arise solely from the Vice of the *Matrix*. He calls the last Sort Womens *Flowers*, as proceeding from the whole Body.

The Causes of the true *Gonorrhœa* in Women, are from the too great Abundance of this seminal Matter, or too large a Supply of Spirits, which tumesfies the Parts, joined to some Relaxation of the internal Orifice of the Womb, that lets this Matter escape: Or they arise from too much Intermission of accustomed Coition, and the passionate Desire of enjoying the Man; particularly if they are fed too high, if their Lives are too sedentary, and they are free from Care and Passion. The Cause of the *Gonorrhœa* is the Relaxation and Flabbiness of the internal glandulous Orifice of the *Matrix*, the Contexture of these Glands being so much relaxed, that they let slip through them, like an universal Strainer, the Mucosity of the crude Chyle that is infused in a great deal of acrid *Serum*, and the Crudities of the Mass of Blood, which comes from the Defect of the Stomach. This Liquor being constantly filtered by the relaxed Orifice, and the Glands, which are without any Contraction or Spring, the *Nympha*, which are naturally dry, now emit a Liquor. This is what makes the Patients so subject to the *Cachexia*, or rather to a compleat *Leucophlegmatia*, or swell'd Feet, without having any Desire to the Venereal Act, Symptoms which appear evident. The Cause which determines these Superfluities of the Blood to flow from this Part, is the Relaxation, and a Kind of *Paralysis* of the internal Orifice of the Womb, and enters the remote Causes of difficult Labour, and the Abortion, which

are such common Causes of that Flux which follows the too great Distention, the Tearing, or some other Wound, of the internal Orifice of the Womb.

The *Whites* are known by the Report of the Patient, and may be distinguished before any Thing else, if it is a true *Gonorrhœa* or a false one. In the first, the Flux is moderate, but small in Quantity, without Acrimony, and will continue a long Time without any considerable Inconvenience. In the false *Gonorrhœa*, the Flux is large or acrid, of an ill Colour, with a Cachexy, Loss of Strength, and Numbness throughout the Body. If the *Lympha* is found to be too acrid, there will appear Nocturnal Fevers, with the Catarrh, or colliquative Sweats. This Flux usually makes Women barren, augments the Cachexy, produces the Dropsy, Falling down of the Womb, Exulceration of the *Vagina*, and at last Death.

The *Chlorosis* or Paleness of Complexion is nothing but a Change of the natural Colour of the Body into a pale yellowish Colour, attended with a languid Deadness throughout the whole Skin, a Loathing or Disgust of Provisions, a Palpitation of the Heart, Difficulty of Breathing, a melancholy or dismal Aspect, and *Oedematous* Tumors on the Legs. This Disease, according to *Lindanus*, consists in a Suppression of the feminal Fluid, which is changed and broke, and so altered, that it putrifies or corrupts the whole Mass of Humours.

The Knowledge of this Disease and its Cause is difficult, and requires the Skill of an able Physician; for it is not without great Danger, because it perverts the whole Economy of the Body. The Heart is always strongly affected, and we see 'em die sometimes very suddenly of a *Syncope*. The Action of the Liver is commonly much altered, and the Stomach appears always in Disorder, in Loathing, and frequently in a Loss of Appetite called *Malacia*. In fine, the *Matrix* receives a great deal of Damage, and may render the Patient barren, if the Disorder is great, and it last any Time.

The *Cachexia* in Women, according to *Et-muller*, is the same with that in Men; with this Difference, that the former is always attended with a Suppression of the Courses, which usually passes for the Cause it self:

That few or none know its real Effects, for the cachectick and caco-chymick Disposition of the Blood, that degenerates from its natural Constitution, which is *Salino-volatile*; and this is the true Cause that stops or checks the Menstrual Fermentation of the Blood, and the Evacuation that follows. *Renautinus* observes practically, that in the Cachexy of Women, the *Menses* are usually suppress'd by abundance of Crudities that destroy Sanguification, and produce a thousand Symptoms. We ought to correct the Cachexy according to the common Practice, by Emeticks and Alteratives, and first of all by Steels; afterwards Aromaticks, adding in the End some acuating Medicines to provoke the Terms, and they will flow readily as before. It is nevertheless certain that the Suppression of the *Menses*, from what Cause soever, is the Source of a thousand Mischiefs, especially if the *Menses*, when actually flowing, come to be suddenly suppress'd by Fear, or some other Cause. Pleuresies, Quinies, Inflammations of the Womb, Epilepsies, and the like, are not half so dangerous; for at the periodical Time the Blood swells, without being able to make an Eruption by the usual Places. We see then it makes Havock every where, the *Pica*, Histerick Fits, terrible Epilepsies, Convulsion, Hypochondriack Melancholy, Scyrrhus, Tumours of the *Viscera*, especially those of the Spleen, are the Consequence. From hence come cruel and obstinate Headachs, frequent Palpitations of the Heart and other Parts of the Body, especially from the Spine, Loins, or *Hypochondria*. In short, the Leven or Ferment of the Stomach is destroyed, the Balsam of the Bile is dead or lost, and the precipitating Virtue of the Pancreatick Juice degenerated, which makes Way for several Sorts of *Cachexia's*, Jaundice, *Leucophlegmatia*, Dropsy, and an infinite Number of Evils, which succeed the Suppression of the *Menses*.

The Histerick Fit or *Passion*, called by some the *Mother*, and others the *Suffocation of the Womb*, from one of the most pressing Symptoms, to wit, the Contraction or Narrowness of the Breast, and the Difficulty of Respiration, which is sometimes so great, that the Patients seem to be choaked or stifled, and remain so for some Time, without Sense or Motion. In the Approach, or at the Beginning

ginning of the Fit, says *Etmuller*, the Patients perceive a Grumbling in the Stomach and Belly, and in those Parts a Kind of Ball that heaves it self up from below. The Tension of the *Hypochondria*, the Noise, Wind and Belchings, succeed. These Belchings are attended with frequent Yawnings, Stretching of the Arms, and other the like Symptoms. They feel the Pains in the Belly, sometimes as if torn in Pieces, sometimes with Distension, sometimes with Contortion, either fixed or wandering. The Appetite is ordinarily abated, and all they eat is of an ill Taste. Their Belly is constipated or bound, and they receive great Relief when relaxed from that State by Clysters, particularly it proceeding from Wind. Some vomit green Matter, and have terrible Contractions of the Breast. The Heart beats and trembles, the Pulse is rare, feeble, small, and intermitting; the *Syncope* succeeds, the Sense is lost, the Breathing laborious, uneven and embarrassed; and when the Fit is violent, they appear dead to our Senses. The Patients feel a Contraction at the Throat, like as if strangled with a Cord. The *Vertigo* and the Dimness of the Eyes gives us Notice that the Paroxysm or Fit is coming, when the Disease is habitual. During the Fit, the Eyes roll, they turn themselves back, and are hid from the Light. Sometimes the Fit ends by a sudden, forcible, and involuntary Laughter, which lasts some Time, and they rave and talk wild. When the Fits are strong, the Convulsions of the Members, and the Epileptick Motions, follow: The Disease then changes its Name, and is called an *Uterine Epilepsy*. The Agitation of the Members, and of the whole Body, the Loss of all Sense, as well internal as external; but we sometimes meet with Cases where the Sense remains free, and the Patients only lose their Words in the Fit, but afterwards recollect, and will recite all that has passed. The Epileptick Convulsions are rare, the Symptoms of the Breast and the *Abdomen* are more common in the Vehemence or utmost of the Access, the Patients are sometimes cold, sometimes hot, and their Heat lasts a great while after. These Symptoms indifferently attack all Sorts of Ages, as well young Girls as Women: Sometimes young People before they are at Age to have their Terms, and old Women

after they have lost them. All these Symptoms are not to be met with in every Patient, nor the same in any one, for some are less afflicted and some more, and with more or less Violence. The Pains and Troubles of the Belly ordinarily begin in the *Abdomen*; the Inquietudes of the Breast, and the Difficulty of Breathing, succeed.

The Histerick Suffocation differs from the *Syncope*, in that it is not preceded by the same Accidents that we have said of the other; that it is attended with a cold Sweat, a greater Paleness of the Face, and a sensible Cessation of the Pulse; and that in the End it much speedier terminates in Death than a Cure. But on the other Hand, Histerick Women sometimes remain two Days in a Fit, and come to themselves again, which ought to be a Caution lest such be buried alive, that they be kept some Days before Interment.

We distinguish this Disease from the *Apoplexy*, in that it happens not so suddenly, nor is attended with so great a Resolution of Parts, or Privation of Sense, nor with a Snoring in Breathing. We distinguish it from the *Epilepsy*, in that we do not see any Spume or Frothing at the Mouth, no convulsive Motions, as in the *Epilepsy*; besides in this the Pulse appears stronger than ordinary, instead whereof, in the Histerick Fits, it is extremely feeble. We observe, that Histerick Women appear sometimes as if they were dead, when the Paroxysm is violent; and that the Things that serve to distinguish whether they are really dead or no, are a Looking-Glass and Feathers; that strong sneezing Powders are very efficacious, if snuffed up the Nose; but if neither that nor strong Vomits or Blisters have any Effect, they are Signs of Death.

The Causes of the Suffocation are either remote or proximate. Among the remote Causes are, the grand Passions of the Soul, especially Anger; and *Etmuller* says, he has seen Women who have fallen into these Fits as often as they have been provoked. The proximate or immediate Cause of this Disease consists, in the vitiated Effervescence of the Pancreatick Juice with the Biliary in the Intestines, from whence arises Wind as well as Belchings. This depraved Juice is thrown into the Vessels, where it coagulates, and
stag-

nates the Blood. The Motion being depraved and irregular from the Animal Spirits, mixes at the same Time in the Part, first of all in the Intercoastal Nerves and *Par Vagum*, and consequently in the rest. From hence comes *Vertigo's*, *Deliria*, and Convulsions of the membranous Parts of the *Abdomen*, Intestines, Melentery, &c. of the membranous Parts of the Breast, and the same of the Heart: That which makes the Palpitation, is a Sense of the Compression in the Heart continued by the Systole. This Disorder, tho' it is not commonly mortal, yet it is not without Danger, and gives a great deal of Terror. Hysterick Fits are of very ill Consequence in Women with Child, and in Child-bearing, because in the last there is Dread of suppressing the *Lochia* or Cleansings, and increasing of Weakness.

The *Furor Uterinus*, or Madness of the Womb, is an excessive Desire of Coition, which carries the Woman to Distraction. They throw away all Modesty to talk lewdly, and they commit a thousand Extravagancies. The Cause is, the abounding, as well as Acrimony, of the feminal Liquor that issues from the internal Orifice of the Womb, which, by its continual Irritation, acts powerfully upon the Animal Spirits in the Brain, giving Occasion to the Soul to form Ideas of amorous Pleasure, and to excite at last such a Disorder, that makes a Kind of *Delirium* only in regard to Venereal Actions. Young Girls in love, and young Women who marry impotent Men, are chiefly subject to this Indisposition, especially if they are sanguine, and live delicately; and the other Non-naturals contribute considerably to the Generation of this Fluid. This Disease is very reproachful, but not difficult to cure, provided Remedies be applied at the Beginning; otherwise, if it be neglected, it may easily degenerate into a perfect Madness.

Barrenness proceeds either from the Husband in the Generation and Ejection of the *Semen*, or from the Woman in the Formation and Disposition of the *Ovaries*, or from the Womb, or the Neck of the Womb; from whence it happens that Women commonly are made barren after a false Conception, or a difficult Labour. The Vice may perhaps

proceed from both the Woman and the Man respectively; so such a Man may not have Children by such a Woman, and yet have Children by another; and so of the Woman reciprocally. All Authors Ancient and Modern agree, that there ought to be a certain Proportion and Harmony of Parts betwixt the Man and the Woman to produce Conception; but no Body has yet explained what that is; or wherein it consisteth. Most Physicians agree, that the Cause of Barrenness is more frequent in the Woman than the Man; for if in the latter, it will appear evident and plain to the naked Eye, it being seated either in the ill Formation of the Yard, or in the Badness of the Seed, both which are visible: But a Woman may be barren, and no Cause can be positively assign'd for it, there being so many Parts that may be defective in her which are internal, and consequently hid from our Eyes.

Among the internal secret Causes of Barrenness in Women, we usually blame the Temperature and Disposition of the Body; but undoubtedly the Formation of the Parts is the most common Impediment: Besides which, there may be a Fault in the *Ovaries* not receiving the spirituous Parts of the *Semen*, to impregnate them; or in the *Tubes*, after they are impregnated, not conveying them into the *Matrix*; or otherwise, in the Constitution of the Body of the Woman, in not affording due Aliment to the *Fetus* after Conception; for Women that are hectic, dry and lean, together with those who are extravagantly fat, are less fruitful than others, and sometimes totally barren. In short, *Issues* that run plentifully, *Ulcers*, and inveterate *Fistula's*, that waste and consume the Mass of Fluids, are general Causes of Barrenness. Where the Membrane of the *Matrix* is too lax, and the internal Orifice of the Womb too open, it subjects the Person to Barrenness, as appears in cachectick Women, and in those who have immoderate *Whites* and *Hemorrhages*, which Sort of Constitutions the Ancients used to call a cold and moist Temperature of the Womb, where the Parts were under a Sort of Inundation of pituitous Moisture: Besides a constant Course of *Whites* will procure a particular *Barrenness*.

We now that a Conception is made, if after Coition or Enjoyment the *Semen* does not fall out of the *Vagina*, but is retained and sucked up into the *Matrix*; if the Woman feels a little Chilliness, with a Kind of Itching in the Womb, which contracts close; if the internal Orifice be firmly shut, and the Natural Purgations cease. However we ought to take Care not to reckon upon that Score alone, for sometimes they will make a Show the Month following, and sometimes two or three Months after in *Plethorick* Constitutions. The Purgations being suppress'd, there grows together a Mass of Humours, which occasion various Symptoms in the first Months of Gravitation, as Shiverings which come by Intervals, Loathing of Victuals, Nauseating after Eating, Vomiting, and Longing to eat or drink whatever their Fancy suggests to them. And these Accidents last generally till the *Fetus* grows pretty large, consuming a good Quantity of Blood for its Nourishment and Increase; and that Nature has driven the Superfluity into the Capacity of the Womb, and among the Tunics or Coats of the *Fetus*, to be thrown out therewith in the Birth.

The *Fetus* in growing makes the Belly swell, but still in a different Manner from that of other Tumors against Nature; that Women who have but once taken Notice of it can easily distinguish; for it raises it self directly towards the Navel, and the Woman in about 4 Months after feels the Motion of the Infant; and to distinguish it from a Collection of Water or Wind, it still keeps hard to the Navel, and does not fluctuate under the Hand: Besides, the Nipples of the Breast turn livid, and after Quickening the Breasts spring with Milk.

The *Mole* is nothing but a Mass generated by Conception in the *Matrix* instead of a *Fetus*, and appears like a Lump of solid Flesh. *Claudius Courvee* thinks, that there is no Difference betwixt a true living *Fetus* and a *Mole* in regard to the Conception, for the same that produces a perfect *Fetus*, being depraved, produces the *Mole*; for it happens equally that a natural and true Conception degenerates at last into a *Mole* in the Time of Formation in the Womb. To understand this the better, the *Fetus* is inclosed

betwixt two Membranes called the *Amnios* and the *Chorion*. The *Amnios* is a thin Membrane, which is as a Wrapper, in which the *Fetus* is formed and kept, and which hinders the albuginous Humour from mixing too plentifully with the gelatinous, that it may not interrupt the Formation: When then the Membrane of the *Amnios* is hurt, and that there is Permission given for the two Liquors to mix together confusedly, the Work of Formation is disturbed, and instead of a perfect *Fetus*, there is generated a Mass of unform'd Flesh, in which Deformity are certain Marks of the wild Imagination impress'd upon it by the Mother. The remote Causes of the Generation of the *Mole* are sometimes in the Mother, that hinder the Formation of the *Fetus* by a fearful Motion, by a Stroke on the Belly, by sudden Anger, or other outrageous Passions, in breaking the Membrane of the *Amnios*, and giving Occasion to the Confusion of Humours.

The Motion perceived towards the fourth Month of the Conception makes us perceive that it is a *Mole*; for when the Mother turns her self from one Side to the other, there is a heavy Mass that follows the same Motion; whereas in a true Pregnancy, the *Fetus* loses nothing in the Womb, but maintains the same Situation, let the Mother turn on which Side she will. The Sense of the Weight is much greater when the Womb bears a *Mole* than when it carries a true *Fetus*, for then the Weight presses upon the *Vulva*, which does not happen in the *Fetus*, which remains in the Belly without incommoding it, and does not fall down till the Time of Birth draws on. In the *Mole*, the Belly does not mount forward, as in the *Fetus*; but it swells equally on both Sides and before, and particularly in the *Hypogastrium*. The Women perceive Pains, with Pricking in the Womb, which, according to some Authors, are particular Signs to distinguish a *Flesh Mole* from a real Conception. The more the Symptoms used to diminish in the true Gravitation about the Middle of the Term, the more they increase and grow double in the *Mole*; which makes those who labour under it extremely pale and without Colour. The Women that are with Child are used to have Milk in their Breasts about the 4th or 5th Month, which does not hap-

jen to those who have *Moles*: Their Breasts swell indeed, but it is with a Matter that is rather serous and watry than milky. In the *Fetus*, the Menstrual Purgation stops entirely; in the *Mole* it is quite the Reverse, for every two or three Months it flows, and the Blood is more plentiful, and of an ill Colour. Women with Child never feel any Pain at the Times of Expectation of their Monthly Courses, or any Tensions, but only a brisker Motion of the *Fetus*. The contrary happens in the *Mole*. These Signs are much plainer when the *Mole* is single, than when join'd to a living *Fetus*, only then the Tumour of the Belly is larger, and the Motion from one Side to the other. The *Mole* is a Case that is always dangerous; for if it is join'd with the *Fetus*, or it destroys it, or else is born with it, it renders the Labour tedious; if it is single, and if it breaks before Delivery, it infects the Womb; if it is not corrupted, but remains entire, it will stay two, three, and sometimes ten Years in the Womb, and possibly may continue during the Mother's Life. In short, if it comes away of it self, which is rare, or by the Help of Medicines, it occasions great Pains, and especially vast *Hæmorrhagies* from the Womb.

Abortion is an Expulsion of the *Fetus* out of the Womb, contrary to Nature, betwixt the Term of its Formation and the usual Time of its Birth, that is to say, from the seventh Day to the Beginning of the seventh Month; for before the seventh Day it is not properly an Abortion, and after the seventh Month it may be a Birth for Life. The immediate Cause of *Abortion* is seated in the Womb; so that its Irritation and Contraction (if unnatural) force it to expel the *Fetus*, or that some extraordinary Relaxation hinder Nature from retaining it to its just Time; for as the Womb is membranous and fibrous, it is from the natural Contraction of these Fibres that the Retention of the *Fetus* depends. It must be then this Spring, which is injured by too great a Contraction or Relaxation of the Fibres and Membranes, that hurts the due Retention of the *Fetus*; and it is push'd out before the Time, or not being able to keep its Hold, it falls out. Among the remote Causes, there are chiefly three, to wit, the Commotion of the Soul, Violence,

or the too great Motion of the Body; and in short, the Fault of the Mother, which does not supply the *Fetus* with proper Nourishment.

The *Matrix* is irritated and excited to expel the *Fetus*, by Means of it self being weak, sick or dying; because the Womb, being injured by the Stench or Action of the *Fetus*, contracts it self forcibly, and makes the Expulsion. The great Passions of the Mind, which violently agitate the Mass of Blood, and put the Spirits in great Disorder, are used to procure Abortion; such are those of excessive Joy, Anger, &c. Food that is too nutritious, and Drink too spirituous, sometimes cause Abortion. The Irritations and Disorders of the adjacent Parts, which have Communication with the Womb, contribute also to Abortion; as the *Dysentery*, that irritates the Intestines; the *Tenesmus*, acrid Clysters or Suppositories imprudently applied, which move forcibly downwards; so Nephritick Women are very apt to be Abortive.

Gripes from the Colick caused by the Use of Autumnal Fruits that are easy of Fermentation, and Gripes join'd with Hysterick Fits, provoke Abortion for the same Reason. The *Matrix* of an ill Conformation, either too strait, subject to some Tumour, or *Scirrhus*, or some secret Ulcer, irritates it self, and instead of stretching to make Room for the *Fetus*, it throws it out. Too great Motion and immoderate Exercise of the Body is very inconvenient and prejudicial, especially in the Middle of their Time of Reckoning. Sneezing, Coughing and Vomiting, have the same Effect, if they are violent.

The remote Causes of the Relaxation, which hinder the Womb from retaining the *Fetus*, are the *Whites* before or after Conception; and the serous *Cachexy*, which renders the Fibres and Membranes of the *Matrix* too loose and slack, so that the internal Orifice is always kept open, which prevents the Retention of the *Fetus*. The Fault or Depravity of the Blood and Spirits is of this Kind; for the Womb wanting Blood and Spirits, loses its Tension and natural Spring, and so lets fall the *Fetus*; which is the Reason why great *Hæmorrhagies*, rash Bleedings, and all those Things which ruin the Blood and Spirits, dispose the Parts for Abortion. Fear and

and sudden Frights sometimes kill the *Fœtus*, and so relaxes the Womb, that it drops the Burthen, as a Fright makes us throw out of our Hands what before we held fast, which Experience shews. The same Thing happens to the Womb; and it is for the same Reason that *Syncope's*, *Lipothimia's*, Fear, and lasting Grief, are used to procure *Abortion*. In short, if *Opium* cause *Abortion*, it is by fixing the Spirits and hindering their Action, by which Means the Membranes and Fibres of the Womb grow lax.

We may foretel *Abortion* by the following Signs: 1. By the unusual Weight of the Region of the Loins downwards: 2. By the wandering Pains which carry themselves to the very Neck of the Womb: 3. By the Eruption of aqueous Blood, like that happens in the Birth: 4. By the Tumour or Swelling, which being first carried up to the Navelwards, descends towards the *Os Pubis*: 5. By the Tremblings, Shiverings, and sudden Heats, which succeed one another, and which are added to Pains of the *Abdomen*. The Signs of *Abortion* are taken from the Breasts, *viz.* from their being dried up and flagging, or from the Milk or Blood that drops from them, which denotes the Cor-

ruption and Decay of the Aliment of the *Fœtus* in the Womb, which is the same Matter as that which swells the Breasts and composes the Milk. Now if that Matter is vitiated, so that it fails entirely, or that it is kept from the Breasts, it betokens the Defect of the *Fœtus*, and consequently the *Abortion*.

An *Abortion* is always more dangerous than a Delivery, because that it makes a violent Rupture of the Vessels and Ligaments which tie the *Fœtus* fast to the Womb; from whence follow great *Hæmorrhagies*, *Fevers*, *Synopes*, *Deliriums*, *Convulsions*, *Inflammations*, and *Gangrenes* of the Womb. Amongst these *Abortions*, that of the first Child is always most dangerous, because that the Parts of Generation are as yet straiter, and extremely sensible. The Danger is still greater in the *Abortion*, as the *Fœtus* is large, and the Mother weak. A violent *Abortion* is succeeded sometimes with Barrenness, by wounding the *Matrix* and *Vagina*, especially in a Miscarriage from the first Conception; after which, it happens that the Woman remains barren, or that she is not with Child again for some Time.

Of the Delivery of Women. From Mr. Dionis.

THE Delivery of Women is commonly performed by Matrons, to whom we give the Name of Midwives. 'Tis nevertheless comprehended under the Number of Chirurgical Operations; and no Man, that is a Chirurgeon, can pretend to understand his Art, without being acquainted with all that relates to the Art of Midwifery: But my Design is not to treat of this Subject in its whole Extent, but only to hint at some Things in the most pressing Occasions. When a Surgeon is called to a Woman who labours under a continual Loss of Blood, he must examine the Cause: If she is seiz'd with intermitting Pains, and Clots of Blood issue forth, 'tis certain there is a false Conception; for if it were only the Woman's

Terms detained, the Blood would run out of the Vessels: The Surgeon must inform himself how long the Woman has been pregnant, in order to judge of the Bulk of the false Conception; as also, whether she before had any Children; for if it be her first Pregnancy, she will suffer much and a long Time, by reason that the *Matrix* not being yet open'd, she must undergo the more Pain to give Issue to the Body that it contains, which being soft, is not capable of forcing a great Extension. Tho' the Pains and Clots of Blood discover to the Surgeon that there is a false Conception, he is yet more assured of it by the Touch: He finds the internal Orifice of the *Matrix* a little open, and introducing his Forefinger, he feels the exorick

Body, which he must draw out as soon as possible. Having then slid in one Finger, he turns it in the Orifice, in order to dilate it more than it already is, and to get in another, and then a third, if he can without Violence, with which he takes hold of the false Conception, in order to draw it out by slow Degrees. If he cannot get hold of it at first, after having turn'd his Finger around, to loosen it from the *Matrix*, he leaves the Woman to repose a little, in order to see whether the *Hæmorrhage* continues; for frequently it ceases when the *Embryo* has no more Life remaining, that is, when 'tis wholly disengaged from all the Vessels of the *Matrix*; and then we expect it to come out of it self, or that it should be driven out by the least Effort of the Woman, as when she offers to go to Stool. But if the Flux of Blood continues to Excess, the Woman may die before the false Conception come out: In order then to deliver her, we use the *Dilator* to open the internal Orifice, and where the Fingers cannot do, the *Crane Bill Forceps*.

The Woman is no sooner deliver'd, than she must be freed from a Mass of Flesh called the *After-birth* or *Placenta*, and that before the Ligature be made on the Navel; but Care must be taken to secure the Child, by expeditiously laying it on that Side. The Surgeon, in holding the Navel-string, must partly wrap it round two Fingers of his left Hand, and taking it with his right as near the *After-birth* as he can, he must gently draw out the *Placenta*, and by easy Motions loosen it, in order to disengage it, if it is not before wholly freed from the Womb. If we oblige the Woman to hold her Hand shut, make her cough or sneeze, provoke her to vomit, or the like, they will assist the issuing out of the *After-birth*, which must not be drawn out too roughly; but if it break, Care must be taken immediately to fetch it out by Hand; and if it sticks to the Womb, it must be dextrously separated by gliding the Hand betwixt the *After-birth* and the internal Surface of the Womb; if it is not easily removed, 'tis better to let some remain to be cleansed away with the *Eochia*, than to tear the *Matrix* too much.

A *Mole* is a fleshy Substance much harder than the *After-birth*. It fills the Bottom of

the *Matrix*, to which it adheres by several small Vessels, which convey Nourishment to it; wherefore it has neither Navel-string nor *After-birth*, from which (like an Infant) it can receive any Sustenance, which must of Course therefore come directly from the Vessels of the *Uterus*. There are two Ways of procuring the Discharge of this *Mole*, either by endeavouring to make the Woman her self drive it out, or attempting to extract it by Manual Operation; it being the Surgeon's Duty always to begin with the most gentle Means, before he proceeds to those of a harsher Nature. If the Woman is neither afflicted with a Fever, or Loss of Blood, he may give her a somewhat violent Purgative, and sharp and stimulating Clysters, which he may several times reiterate, in order to excite Pressures, which dilate the *Matrix*, and make Way for the *Mole*: He may make use of Butter to rub the internal Orifice, to render it the more subtile and dilatable: He may try emollient Injections, Bleeding of the Foot, or a gentle Bath, according as he shall think fit. If the *Mole* is but of an indifferent Bulk, and does not stick very fast, these Remedies may drive it out; but if it is of an excessive Largeness, and sticks very fast, it requires the Surgeon's Hand; but if the *Mole* be so big that it cannot come out, the Operator must make use of the sharp edg'd *Crochet*, in order to get it out by Bits, when he cannot otherwise succeed.

When a Surgeon is call'd to an impregnated Woman, who has an *Hæmorrhage*, before he proceeds at all, he must examine its Cause, in order to discover, whether it be a *Menstrual Flux*, or a real *Hæmorrhage*. There are certain Signs by which we may discover the Difference betwixt the one and the other. The *Menstrual Flux* runs by little and little, and without Pain; it comes at its regular Time, and ends after a short Space, as two or three Days; it is not accompanied with Clots, nor is it excessive. But the *Hæmorrhage* comes with Pain, and almost always suddenly; the Blood flows out in great Abundance, and continues so to do without Relaxation; for if it seems to cease for some Moments, the Blood in the interim does not leis issue out of the Vessels, when falling into the *Vagina*, it clots: These lumps coming

coming to be drove outwards, the Blood again begins to run out more than before ; so that without Help, and speedy Delivery, both Mother and Child will perish. You ought not to be surprized that I talk of Women with Child having their Terms, of which we have so many Instances, that 'tis out of Doubt. Some Women only have them the first Months, others void something till the fifth or sixth Month ; and there are yet others from whom they run during the whole Time of their Pregnancy, which very frequently deceives Women ; whence it is that they don't certainly know whether they are with Child or no, nor when they conceived.

When the Flux is barely of the Terms, no more is necessary than to leave the Woman to Rest ; but when 'tis an *Hemorrhage*, the Surgeon must examine whether it proceeds from the Fund of the *Matrix*, or from the Vessels of the *Vagina* and internal Orifice. The Way to be convinced of this, is to feel with the Finger whether the internal Orifice is dilated ; and if in introducing it into that Orifice we advance so far as the Membranes of the Child, 'tis a certain Sign that the Blood comes from the Fund of the *Matrix* ; but if on the contrary that Orifice is close shut, the Blood infallibly escapes from the Vessels which moisten that Orifice and the *Vagina* : In which Case the Surgeon has no more to do than to oblige the Woman to keep her Bed, bleed her, separate her from her Husband for some Time, and give her no Medicine, for fear of exciting or augmenting by that Means the *Hemorrhage*. Several Women have gone their due Time with their Children, tho' the Blood which flow'd from them has been sometimes accompanied with Clots. When the Blood proceeds from the Bottom of the *Matrix*, 'tis always because the After-birth is wholly or partly separated, and it never rejoining, 'tis absolutely necessary that the Woman be delivered. But if the Blood issues forth in large Quantities without Interruption, as though it streamed from the Aperture of a large Vessel, or the Patient falls into a *Syncope* or *Convulsion*, her Delivery must not be deferred, whether her Time be expired or no, whether she have any Labour Pains or not, there is no other Way left to save her Life.

These Cases are very prejudicial to the Practitioner, for if on the one Side he reflects on what he has to fear with Regard to himself, he knows that he hazards his Reputation ; or if the Woman dies in her Delivery, or a little Time after, for Want of a sufficient Stock of Blood to maintain the Circulation, the Publick then never fails, tho' unjustly, to lay the Blame at his Door ; and if on the other Side he looks on the Woman, he knows that she must be delivered or die ; whence it is that some Practitioners in this Art avoid as much as is possible this perplex'd *Dilemma*. Yet Christian Charity ought to balance us, and without any cautious Reserve what we ought not to do, prevail on us generously to chuse that of relieving the Patient. But before he begins, the prudent Surgeon ought securely to shelter his Reputation under his Prognostick, and to that Purpose to call together the Friends and Relations of the Patient in an adjacent Room, and remonstrate to them her dangerous Condition, acquainting them, that the only Way to save her Life is to deliver her, tho' at the same Time he can not answer for her Life, but Delivery may recover her from a Death, which is unavoidable without it. This done, the Surgeon immediately causes the Woman to be laid athwart the Edge of the Bed, her Legs wide extended, and held bent at the Knees by two Persons, others continuing behind, to prevent her shrinking backwards at the Time of Operation. Then he introduces his Hand into the *Vagina*, advancing first one Finger, afterwards two, and lastly a third, if he can, into the internal Orifice of the *Matrix*, with which he dilates it by gentle and slow Degrees. If the Membranes of the Child are not open, he breaks them with his Fingers, which makes Way for him to turn the Infant, in order to draw it out by the Feet.

When he hath gotten the Feet together, he pulls them with a warm Cloth, that they may not slip in drawing, always taking Care that the Face be turned downwards, for fear the Chin should catch upon the *Oss Pubis* when it comes into the Passage. When the Child is born as far as the Cartilage of the Breast, he slips in his Right Hand forwards, in order to extend the Child's Arms along the Right Side of the Body, and that done,

done, does the same to the other Arm. When it comes to the Head, the Surgeon must not pull too hard, for fear of separating it from the Body, which sometimes happens: Nor ought he to suffer the Child to remain too long in that Posture, for fear it be strangled. He must oblige some Body to hold the Child up, whilst he glides one Hand around the Head, in order to disengage it by little and little; then put the Middle Finger of the other into the Child's Mouth, and presently oblige the Person which holds up the Body to draw it out, which is done with much more Ease this Way, than if the Surgeon did not help by his two Hands after this Manner.

The Infant being in the World, the Surgeon easily compleats the Delivery of the Woman; by reason that the After-birth, in these Kinds of *Hæmorrhages*, is always separated from the *Matrix*. As soon as the Woman is delivered, her Flux begins to decrease, and soon after wholly ceases, because the *Matrix* in its closing again stops the Orifices of the Vessels from whence the Blood flow'd, and which were kept open by the Distention which the Child occasioned when in this Part; so that if we should not draw out the Child, the Blood would issue out at these Orifices to the last Drop. Notwithstanding all the Fatigues which attend the Laying of Women in these Circumstances, the Surgeon has sometimes the Chagrin to see the Patient expire soon after her Delivery. Five or six Hours being past after her Delivery, and she having had Time to take some Refreshment of Chicken Broth, or the like, to repair her lost Blood, she is safe; but if she ends her Life half an Hour or an Hour after her being brought to Bed, 'tis because she had not Blood enough remaining in her Vessels to preserve its circular Motion.

When the Child's Head does not present to the Passage, the Delivery is term'd laborious, because the Infant not being in its natural Situation, can hardly come out of the *Matrix* without the Assistance of a Surgeon or Midwife. It may present it self in an infinite Number of Postures; but the worst of all is, when one Hand comes out first. When a Surgeon knows how to relieve a Woman in these Sorts of Labours, he is undoubtedly able to help them in all others,

that being the most difficult of all. If th, Midwives would call us to help them when they feel the Hand of the Child, as soon as the Waters are broke, we should turn the Child with more Ease; but they often do not desire our Assistance, till they have tried to deliver the Woman by drawing the Child's Arm outward; which they having engaged in the Passage, it renders the Delivery more laborious and difficult. The Surgeon who is called on such an Occasion, after informing himself how long the Hand has been out, begins with feeling the Pulse of the Child, to discover whether it be dead or alive. If by the Beating of the Pulse he finds it alive, he makes the more Expedition. Then he causes the Woman to be laid on her Back on the Edge of the Bed, as in the Case before, and prepares himself to turn the Child, in order to take it by the Feet, because he must not pretend to be able to save it any other Way; for he would sooner pull off the Arm of the Child, than draw it out by that Member. When an Arm is in the Passage, the Child lies athwart it, with its Head on one, and the Body on the other Side of the *Uterus*, in which Posture 'tis impossible it should ever come forth. It must then be turned; in order to perform which, the Surgeon examines whether the Child's Hand be the Right or the Left, and considers which of his own Hands he ought to make Use of. He also observes whether the Palm of the Child's Hand be upwards, which shews him that it lies on its back, for if downwards it would be the Reverse.

These Observations having determined him, he gently introduces his Hand into the *Matrix* along by the Child's Arm, which he grasps near the Shoulder, in order to push it towards its Head, and obliging it to move out of the Passage, he makes Way for the Feet to approach, in order to find them the more readily, and secure them. He must as soon as he has got one of them draw it forth, which will make the Child of its own Accord turn it self to a more favourable Situation; but sometimes, before searching for the other Foot, it will be proper to tie the first with a Ribbon, because if the Child should withdraw it whilst the Operator is employ'd in Quest of the other, he would be obliged to search for the first a second

cond Time. The Surgeon having got one Foot, slides his Hand up to the Top of the Thigh on the same Side, whence he passes to the other, slipping his Hand to the Foot, which he brings to the Passage to the first, in order to draw them both out, holding them with a warm Cloth, that they may not slip. If the Child lies on its Belly, he continues drawing of it out immediately; but if on its Back he turns it in Proportion to the Advances he makes in drawing it out; and in all other Particulars he manages himself as already laid down. If the Arm is so far driven out, or is so large, as not to allow Room for the Surgeon to introduce his Hand, and there appear certain Signs of the Death of the Child, *Ambrose Parey* advises us to cut off the Arm; but we ought to be well assured that the Child is dead, which we may certainly be, if by feeling the Pulse we do not find any Pulsation. Ancient Authors tell us, that we ought to reduce to their natural Posture whatever is situated contrary to Nature; that is, that we ought to reduce all Infants in the *Matrix*, or its internal Orifice, to lie with the Head foremost: But daily Experience shews us, that this is not always practicable; for it is impossible to bring the Head into the Passage, because there is no Hold to be taken of it, but it is not very difficult to draw the Feet thither, because we can grasp and guide them whither we please.

There are Signs which discover the Death of a Child in the *Matrix*, the principal whereof are, the Woman's feeling a great Weight at the Bottom of the *Hypogastrium*, her Belly falling, and the Child sitting like a Bowl to that Side on which she lies; if touching the Navel we find no Manner of Pulsation, if an Arm or a Leg hanging out we find the *Epidermis* easily separate; if blackish, stinking and cadaverous Humidities issue from the *Matrix*; and lastly, if the Mother no longer perceives it move, then the Surgeon has no Room left to hope for Help on the Child's Part, who like a Mass of Lead is wholly unable to make any Effort in Order to get forth, unless it be by its own Weight, which renders the Labour very long and painful. Nor ought we to expect much from the Mother, whose Pains on this Occasion are so feeble and slow, that they

are not sufficient to bring forth the Child. Nay it happens sometimes that she has none, which lays the Surgeon under a Necessity of helping her, without which she cannot be delivered. If the Child is in a proper Posture, he ought to rowse the Pains, which are as it were asleep, by strong and active Clysters, that stimulate the Intestines, and facilitate the Birth. I am not of Opinion to oblige the Patient to internal Remedies, such as are those that ease and compose to Rest, or violent strong Medicines, that provoke to Labour, for they are dangerous, and may occasion cruel Symptoms. If these Clysters have not their expected Effect, the Surgeon ought to go to Work, and endeavour by Manual Operation to draw out the dead Child as soon as he can.

To perform this Operation, he must cause the Woman to be placed in the Posture already mentioned, and if it be long since she made Water, he must introduce a *Catheter* or *excavated Probe* into the Bladder to discharge the Urine, which filling that Vessel will incommode the Delivery; then sliding his Right Hand into the *Matrix*, if he does not find the Child's Head too far engaged in the Passage, he pushes it back, and sliding his Hand under the Child's Belly, he searches for its Feet, in order to turn it, and bring it forth pursuant to the precedent Article, taking special Care not to pull too hard when the Head sticks, for fear of beheading the Child, which by reason of its Putrefaction may happen, if it be drawn with too much Precipitation; but if the Child be deprived of its Head, it must not be left in the *Matrix*, but extracted by a blunt *Crotchet* fix'd on one Side of the Head, while the other Hand rests on the same *Crotchet* to conduct it forth.

But if the Child's Head presenting first is so far advanced and engaged in the Passage, that it cannot be shoved back without offering too much Violence to the Woman, the Surgeon must endeavour to bring it out in that Posture; and the Head being round and Slippery, by reason of the Humidities in which it has been moisten'd, so that he cannot take any Hold of it with his Hands, he must have Recourse to a sharp pointed *Crotchet*, which he thrusts as far as he can betwixt the *Matrix* and the Child's Head, guiding

guiding that Instrument with the Palm of one of his Hands, with the Point turn'd towards the Head, which it must fix upon in a solid Place, that it may not slip from it. Being thus fixed, he brings forth the Head, by applying his Left Hand to the other Side of it, opposite to the *Crotchet*, in order to help to disengage and conduct it directly through the Passage. If his Hand be not sufficient, he takes a second *Crotchet*, which he introduces in the same Manner as the former, and fixes on that Side of the Head where his Hand was. With these two *Crotchets* he draws forth the Child equally, how big soever it may be. If after the Head is come forth the Child sticks by the Shoulders, he disengages them by slipping one or two Fingers of each Hand under the Arm-pits, in order by that Hold to draw the Child wholly out. When he is obliged to cut the Child in Pieces, either by Reason the Passage cannot be sufficiently dilated, or the excessive Bulk of the Child's Parts, he makes Use of a *Crotchet* shaped like a crooked Knife.

Womens Labours are generally followed by so many grievous Accidents, that it would be difficult to particularize them all. I shall only mention two, because they require Manual Operation: One is the Rupture of the under and Forked Part of the *Rima Magna*, or *Fossa Navicularis*; and the other the *Procidencia Uteri*, or falling out of the *Matrix*. The Name of Forked is given to the lower Part of the *Vulva*, from its being of that Figure. It makes the Separation betwixt the *Grand Fissure* and the *Anus*. It frequently happens that by hard Labours this Part is broken, so that the two Apertures, that of the *Matrix* and that of the *Anus*, are run into one; wherefore the Surgeon must remedy this Dilaceration by some Stitches of the Needle; but before the Wound is sowed, it must be washed, and well cleansed with warm Wine, and before closing the Stitches the Surgeon must apply to the Part the White *Peruvian Balsam*, or that of *Arcaus*, in order to healing the Wound. On that Side next the *Vulva* must be applied an astringent Plaister, as well to reunite, as to defend it from the Urine, whose Acrimony would excite Pain, and hinder its Re-union.

Scarce any Indispositions are more frequent than the *Descent* and falling out of the

Womb; an infinite Number of Women are afflicted with it, and this Sort of Disease is more difficult to cure, by reason Women out of Modesty will suffer long before they complain. We must distinguish betwixt the *Descent* and Fall of the *Matrix*; the first is, when the *Fund* or Bottom of the *Uterus* descends from its Place, and falls into the *Vagina*; and the second, when the same falling lower comes entirely forth: So that the *Descent* is properly no more than a Relaxation of the Body of the *Matrix*, whilst the *Falling* is a *Precipitation*.

All *Descents* of the *Matrix* are not alike, for the *Uterus* often proceeds no farther than to occasion a Weight in the *Vagina*; at other Times it descends as low as the *Carnacles*, and then with the Finger we feel the internal Orifice very near; and at other Times descending yet lower, the internal Orifice appears without the *Privities*.

The Fallings or *Precipitations* of the *Matrix* are of two Sorts; one is, when the *Matrix* falls out without its *Fund*, being turned the wrong Side outwards. In this Case, we see the internal Orifice at the Extremity of a great round fleshy Mass, which is the Body of the Womb. The other is, when that Part is not only fallen out, but when its *Fund* is entirely turn'd Inside outwards, in such Manner, that it seems to be nothing but a great Piece of bloody Flesh hanging betwixt the Woman's Thighs. 'Tis always a Relaxation of the large Ligaments of the *Matrix*, which permits it to descend or fall, and never a Rupture of the Ligaments, as some have imagined. A thousand Accidents cause these Relaxations: I shall not recite them here, but content my self with hinting only that the principal of them proceed from hard Labour. In these Indispositions, the Women feel an extream Pain in the Region of the Reins. They complain of a heavy Weight at the Bottom of the Belly, which is often accompanied with a Difficulty of Urine, and they require speedy Help, if they are willing to be cured; for the older these Infirmities grow, the more difficult 'tis to complete their Cure, which consists in two Particulars, first to return the *Matrix* to its natural Situation, and secondly to continue and fix it there.

The simple *Descents* of the *Matrix* don't require a great Operation; but first of all we must examine the Cause of them. If the *Uterus* is only tumefied by the Suppression of the Terms, which renders it ponderous, the Surgeon must procure Evacuation; and if by reason of the Weakness of the Ligaments it descends too low, it must be fortified by Astringents and Corroboratives boiled in thick Wine, in which the Surgeon dips his Bolsters, which he applies to the Reins and Belly, after having reduced the Part to its Place; which is sometimes accomplish'd by barely making the Woman lie down on her Bed, or by laying the Palm of his Hand on her Lower *Venter*, and pushing up the *Matrix*; or by introducing into the *Vagina* a Wax Candle excavated like a Pipe, with which we instantly return it to its natural Place. Some affirm the Husband's Yard to be a proper Instrument, but the Action thereof rather causes the *Uterus*, after it is pushed up, to fall lower than before.

In the *Fallings* of the *Matrix* in which the *Fundus* is not turned Inside outwards, the greatest Difficulty lies not in restoring it to its Place, but in keeping it there when replaced. The most certain Remedy to be made Use of against its falling out again is a Pessary, which must be introduced into the Neck of the *Uterus*, in order that by sustaining the Bottom thereof it may keep it in its ordinary Situation. The Matter of which Pessaries are made is commonly Cork, that they may be the lighter. They are dipped in Melted Wax, to fill up their Cavities, that their uneven Surface might not hurt. They are of two different Figures; some are oval, and shaped like an Egg, the Bulk and Length proportioned to the Neck of the *Matrix*, into which they are to enter, to which is fastned a small String, which has two Uses, one to draw the Pessary out when we think fit, and the other to fasten it to a Ribbon or Tape which goes round the Body, to hinder it from falling to the Ground, if the Patient happens to walk abroad, which these Pessaries are apt to do, particularly in the Time of the Menstruous Flux. There are Pessaries of other Shapes; some are circular, and others somewhat inclining to oval, shaped like a small Roll. In the Middle they are pierced through, and

a Hole left large enough to allow Passage to the Women's Terms, and which admitting the internal Orifice into its Cavity, retains it in its Place, and supports it. They are made a little large, to the End that, entering with a little Force, they may the better stay in. One of these two stands in Need of a String to withdraw it, but the other wants none, the Finger being sufficient to pull it out at Pleasure. These Pessaries once placed must not be drawn out on account of the Necessities of Nature, by reason that, being provided with a Hole, a free Passage is left for the Excretions of the *Matrix*; and if they are well made, they don't incommode that Woman that wears them, nor hinder her conversing with her Husband, or even being impregnated, because the internal Orifice may receive the Seed that is emitted.

In the *Fallings* of the *Matrix* in which the *Fundus* is absolutely turned Inside outwards, as we would turn a Purse, we must expeditiously thrust it in; and this Accident very frequently happening through the Fault of the Midwives, who pulling the *Navel-string* too hard to get out the After-birth, bring along with it the Bottom of the Womb, to which it sticks. As soon as they perceive the *Fundus* to follow the *After-birth*, it must be separated, and the Bottom of the *Uterus* restored, by thrusting it again into its Place, which is then easily done, because the internal Orifice was extremely dilated, to let the Child pass out. But if the Midwife defers it, the Orifice closes by little and little, in which Case 'tis very difficult to restore the *Fundus* to its Place, and the Woman dies before she is helped. Nevertheless if the Surgeon be called Time enough to remedy this turning outwards of the *Matrix*, which he will discover by seeing betwixt the Woman's Thighs a Sort of Bloody *Scrotum*, he then begins by obliging the Patient to arise, and ordering a Clyster to be administered, if it was long since she had been at Stool. He then makes her lie on her Back, with her Buttocks raised higher than her Head; then after having with warm Wine and Water fomented all that's come out, he gently thrusts it back into its appointed Place. If it is not to be got in without too much Difficulty, he must make an *Embrocation* with Oil of sweet Almonds, which will help the

Reduction, by rendering the Fibres of the Organ softer and more extensible. But if notwithstanding all the Surgeon's Endeavours, the *Matrix* cannot be got in again, either by reason 'tis too much tumefied, or that it has been delay'd too long, 'tis in great Danger of gangrening in a little Time. Some Authors advise us in this Case to extirpate it, and assure us to have seen Women thus cured; but as for me, I shall believe the Extirpation of the *Matrix* mortal, till I shall be convinced by Experience.

The Orifices, as well as the Neck of the Womb, are liable to several Indispositions, which result from hard Labours; but they not requiring Manual Operation, I shall leave them to the Prudence of those concerned in the Management of them. But if the Infirmary is in the Neck of the Womb, there must be a *Dilator* made Use of, which being introduced into the *Vagina*, will separate the Lips, and enable the Spectator to see the Infirmary; but if there be an Ulcer at the internal Orifice, then use the *Speculum Matrixis*; It has three Branches, which join'd

together are thrust gently into the Neck of the *Matrix*, then turning a Screw they separate from one another, and by the Space which they leave betwixt themselves, allow the Surgeon to take a distinct View of the internal Orifice; which at first Sight will satisfy him of the Infirmities with which it is afflicted, and facilitate the Application of necessary Remedies.

But at present the most able Practitioners of the Art of *Midwifry* content themselves with the making Use of their Fingers, three of which they engage one after another in the *Vagina*, with which they dilate the Passage triangularly, and that as much as is necessary to perceive all that prejudices the *Uterus*, which are as well discovered by the Touch as the Eyes, and that in a Manner less incommodious to the Patient, and more instructive to the Examiner, than if he made Use of a *Speculum Matrixis*, by the Help of which we are not so well informed when we are in Danger of breaking some Fibres by Dilation.

Several Figures of the Parts of Generation in Women. Taken from Swammerdam.

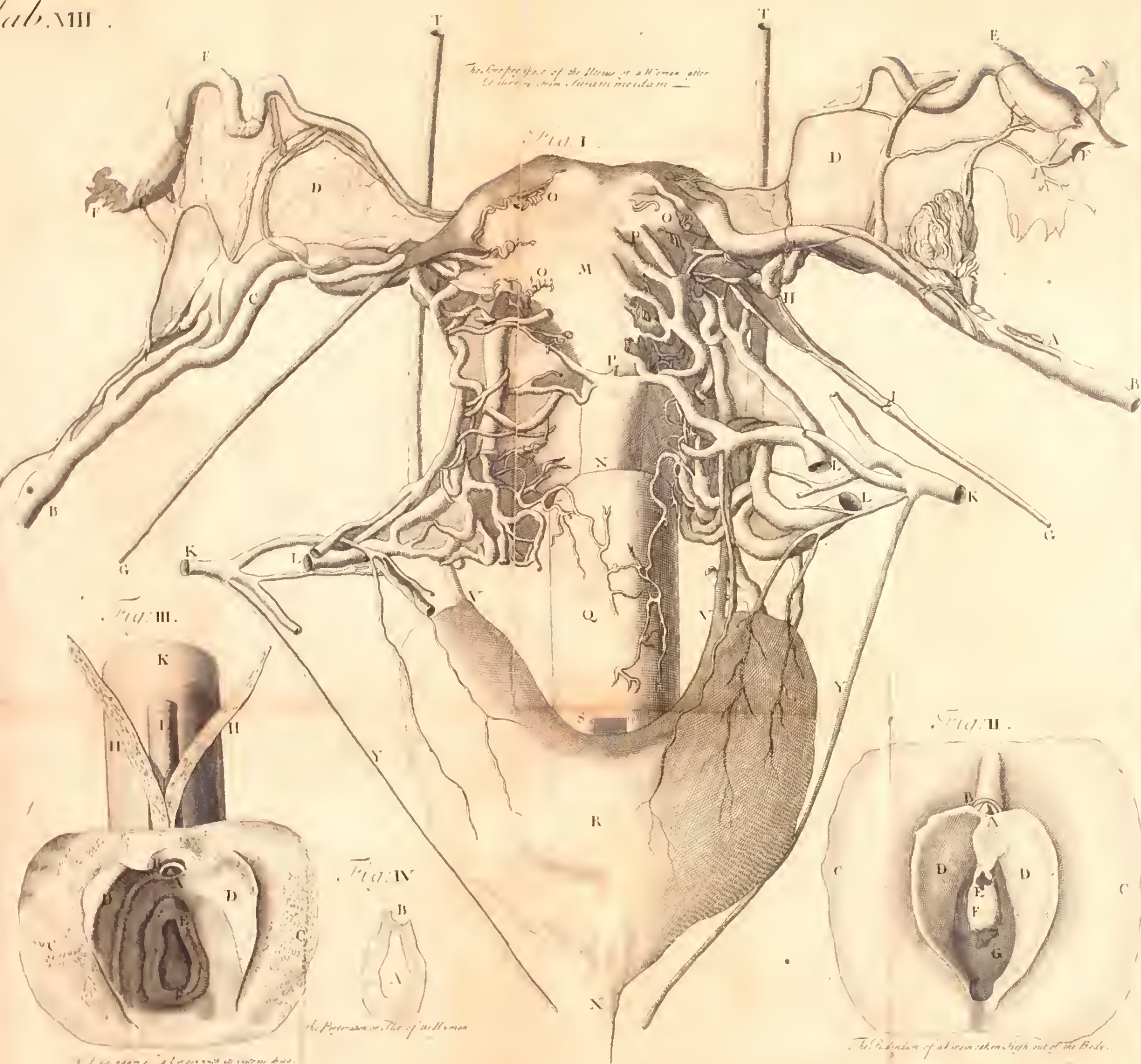
T A B. VIII.

Fig. I. The fore Prospect of the Uterus of a Woman after Delivery.

- A, A. The Spermatick Arteries.
- B, B. The Spermatick Veins distributed through the *Tubes* and *Fundus* of the *Uterus*.
- C, C. The *Corpora Pyramidalia*, composed of the Spermatick Arteries and Veins.
- D, D. The membranous or broad Ligaments of the Womb, through which the Blood Vessels pass to the *Fallopian Tubes*, called by some *Ala Vespertilionum*.
- E, E. The *Fallopian Tubes* well express'd.
- F, F. Their Aperture at the *Expansum Foliosum* on each Side.

- G, G. The round or inferior Ligaments of the Womb.
- H. The Origination of the Veins and Arteries of those Ligaments.
- I. The Valve in the Vein of the round Ligament, hindering the Relapse of the Blood to the *Uterus*.
- K, K. The two *Hypogastrick* Arteries.
- L, L. The *Hypogastrick* Veins variously contorted, and in their Progress implicated and perplex'd with the Arteries.
- M. *Fundus Uteri*.

N. The



The Superior part of the Uterus of a Woman after
it has been taken from the Ligamentum

Fig. I.

Fig. II.

Fig. IV.

Fig. III.

The Protrusion of the Uterus

The Protrusion of a Vessel taken high out of the Body.

A View of the Uterus of a Woman with its Ligaments

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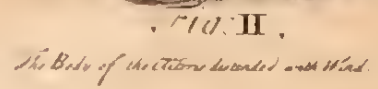
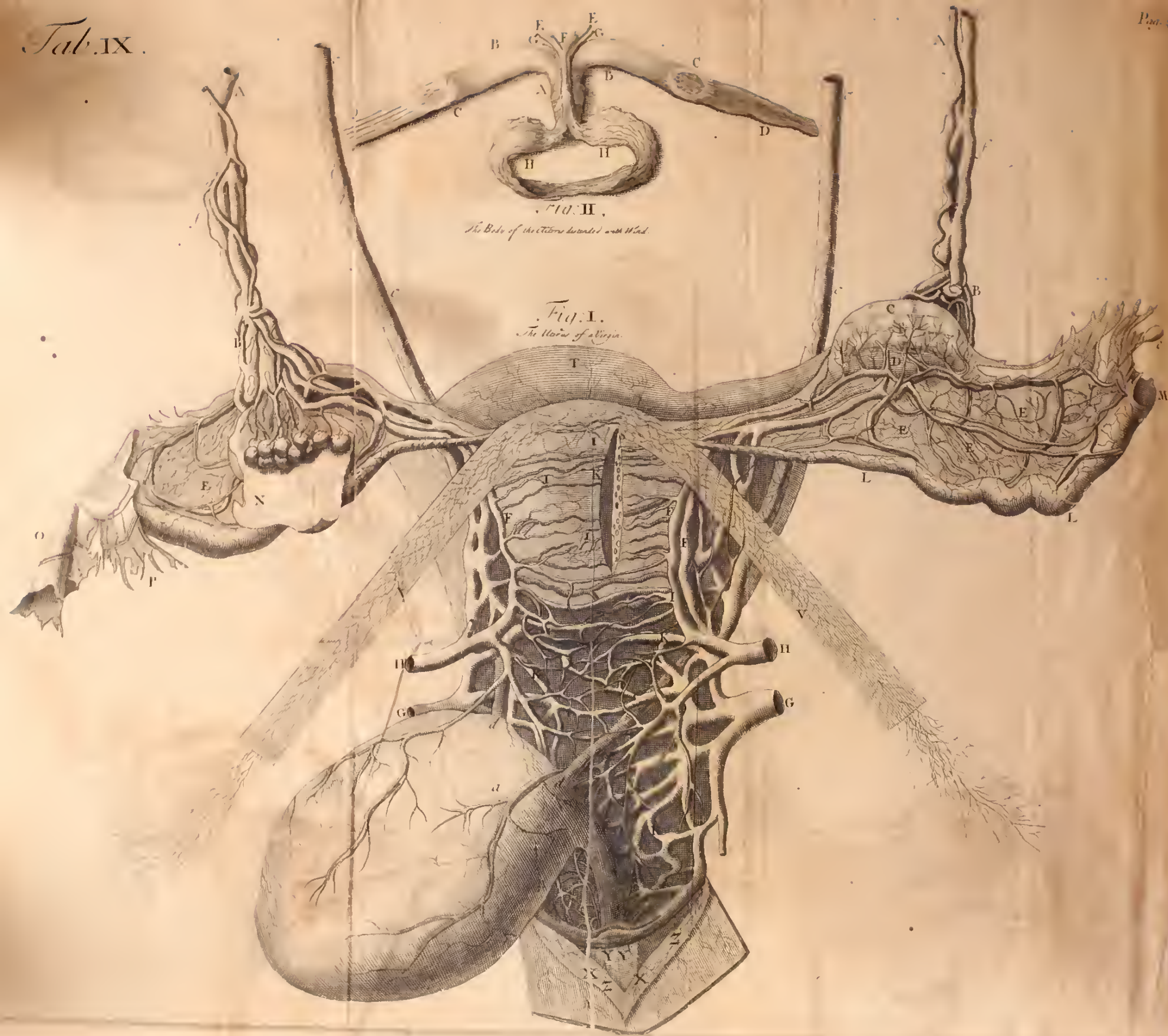


Fig. I.
The Waves of a Virgin.



- N. The *Cervix* or Neck of it, at the End of which is the inner Orifice of the Womb.
 O, O, O. The Arteries on the *Fundus* or Bottom of the Womb, curl'd like the Tendrils of a Vine.
 P, P. A great Number of Veins running over the exterior Tunick of the *Uterus*, in which the *Anastomoses* are singularly remarkable.
 Q. The *Vagina Uteri*.
 R. The Bladder of Urine inverted, to shew the Tortuosity of the Arteries of the *Vagina*, by which Means its proper Vessels are represented somewhat longer than ordinary.
 S. The Orifice of the *Urethra* in the *Vagina*.
 T, T. The Ureters.
 V, V. The Insertion into the Bladder, which is here turned downwards.
 X. Part of the *Urachus*.
 Y, Y. The Umbilical Arteries.

Fig. II. Exhibiting the Pudendum of a Virgin taken fresh out of the Body and display'd.

- A. The Glans of the Clitoris, resembling that of a Penis.
 B. The Prepuce of the Clitoris.
 C, C. The Labia Pudendi.
 D, D. The Nymphæ.
 E. The Orifice of the *Urethra*.
 F. The Caruncle that closes the *Meatus Urinarius*, in which are divers Fissures.
 G. The Hymen.

Fig. III. The Pudendum of a Virgin, with its Clitoris dried.

- A. The Glans of the Clitoris, answering that of a Man.
 B. The Prepuce of that Glans.
 C, C. Labia Pudendi.
 D, D. The Nymphæ.
 E. The Orifice of the *Meatus Urinarius*.
 F. The Hymen.
 G. The Perforation of the Hymen.
 H, H. The *Crua* of the Clitoris cut, to shew the Substance of its cavernous Bodies.
 I. The Urinary Passage cut off near the Bladder.
 K. The Neck of the Uterus cut off.

Fig. IV.

- A. The Perforation or Slit of the Hymen.
 B. The upper Part of the Hymen next the *Meatus Urinarius*.

T A B. IX.

Fig. I. From the same Author, shews the Uterus of a Virgin.

- A, A. The Spermatick Vessels, from their Rise to their Dissemination through the Ovaria, Tubes, and Fundus Uteri.
 B, B. The Corpus Pyramidale on each Side, compos'd of Branches of the Spermatick Artery and Vein.
 C. The Left Testicle or Ovary, covered with its proper Membrane, through which Eggs appear protuberant.
 D. The Distribution of the Spermatick Artery and Vein upon the Left Ovary.
 E, E, E, E. The Branches of the same Vessels marching over the membranous Ligaments, or *Ala Vespertilionum*, to the Tubes on each Side.

- F, F, F.* The Spermatick and Hypogastrick Vessels, which run curling together along the Sides of the Neck of the *Uterus*, under the *Tubes* and round Ligaments, and inosculate freely on each Side.
- G, G.* The Hypogastrick Veins.
- H, H.* The Hypogastrick Arteries.
- I, I, I, I.* The *Anastomoses* of the Arteries express'd.
- K, K, K.* The various Implications and numerous Inosculation of the Vessels finely express'd.
- L, L.* The Left Tube or Horn of the Womb.
- M, H.* The Aperture of the Tube display'd, with its Fringe, resembling the tatter'd Edges of a worn Cloth.
- N.* The Membrane of the *Testis* separated and turned back, to shew the *Ova* and the Spermatick Vessels going to and from them.
- O.* The right Tube inverted, to shew its Capacity, through which the *Ova* descend to the *Uterus*.
- P.* The Fringe of the Right Tube.
- Q.* The *Fundus* of the Womb obscurely protuberant.
- R.* A Slit in the Body of the Womb.
- S.* The Substance of the Womb, in which appear the Orifices of the Blood Vessels cut transversely.
- T.* Part of the Membrane covering the *Intestinum Rectum*.
- V, V.* The round Ligaments, which are nothing but the Arteries and Veins which go to the *Clitoris* and *Pubes*, wrapp'd up in their proper *Involucrum* or Tunick.
- X, X.* The *Crura Clitoridis*, or its Divarications, called by *Swammerdam* *Crura externa*.
- Y, Y.* The cavernous Bodies of the *Uterus*, taken Notice of by *De Graef* under the Name of *Plexus Reticularis*, but here called *Crura Clitoridis interna*.
- Z, Z.* The Vessels of the *Clitoris*.
- a.* The Bladder of Urine turned towards the Right Side.
- B.* The Insertion of the Neck of the Bladder near the *Clitoris*.
- C, C, C, C.* The *Ureters*.
- d, d.* The Insertion of the *Ureters* into the Bladder.
- e, e.* A *Hydatis*.
- f, f.* The Valves of the Veins.

Fig. II.

- A.* The Body of the *Clitoris* distended with Wind, as it is with Blood in *Coitu*.
- B, B.* Its *Crura* also distended.
- C, C.* The Extremities of the *Corpora Cavernosa* of its *Crura* cut from the *Ossa Pubis*.
- D, D.* The *Musculi Erectores Clitoridis* freed from the *Ossa Coxendicis*, and left at their Terminations.
- E, E.* The Arteries.
- F.* The great Vein,
- G, G.* The Nerves of the *Clitoris*, which pass likewise to the *Corpus Cavernosum Pudendi*.
- H, H.* The *Corpus Cavernosum Pudendi* inflated by the Vein of the *Clitoris*, *F.*

Of Delivering Women, and the Diseases attending them, by Monsieur de la Vaugion, M. D. and Intendant of the Royal Hospitals about Paris.

THIS Operation is an Extraction of the Child, together with the Membranes which contain it, and the Placenta or After-birth, out of the Mother's Womb.

The Cause of a Big Belly is the Child contained in the Womb.

The Signs which demonstrate Conception, are the mutual Conjunction or Coition of both Sexes: If after Reception of the Male Semen the Womb is close, nothing comes away, and the Man's Yard is not so wet as usual; this is a Sign there is a Conception, and that the Masculine Seed is retained in the Womb.

A Woman after Conception feels some small Pain round about the Navel, and some Working in the lower Belly, which arises from a strong Contraction of the Womb, when it closes it self, which creating a Motion in the Bladder, draws down the Urachus, which terminates in the Navel, and this creates a little Pain in that Part. This Commotion of the lower Belly proceeds from the Irritation of the Rectum, by the Motion of the Womb which lies on and is appended to it.

It is observable, that the internal Orifice of the Womb, in Women who have had Children, is not so exactly closed in the Time of Conception, as in Women who never had a Child.

The Nausea, the Loss of Appetite without any visible Distemper, a Longing after odd and uncommon Things, Sickneis and Vomiting continuing for a long Time together, Listlessness, Doziness, Frowardness, and ill Humour without a Reason, Pains in the Teeth to which she was not subject before, extraordinary Spitting, Retention of the Courses, or Evacuation of them at an un-

usual Time; Rising of the Breasts, a Hardness and Pain in them, the Nipple growing hard, and encreasing in Bigness a little (because of the Repletion); the encreasing of the little Circle, its brown Colour, the Protuberance of the Navel, the Softness and Laxity of the Eye-lids, which are difficultly kept open, their heavy Aspect, with a Yellow Livid Circle round them; the Eyes sunk, their Whites turbid, a languishing Look, the Blood let out bad, Emaciation, a big Belly, which gradually encreases; all these after Coition are Signs of Conception, all which sometimes appear at once, and sometimes only Part of them.

The Reader ought here to observe, that several of these Signs happen to Maids in a Retention of their Courses; as for Instance, Nausea, Vomiting, though not so frequently; Risings, Hardness and Pain in the Breast and Belly, Appetite to odd and uncommon Things, livid Eyes, their Womb may be closed. On the contrary, Women may sometimes have their Courses the whole Time of their going with Child, but not in so great Plenty as at other Times.

Of the Signs which precede and accompany a Natural Delivery.

Sometimes the Life of the Mother, as well as that of her Child, is indanger'd by hastening her Delivery, before the Term of her going with Child is completed.

Cholick Pains, arising from Wind imprisoned, and moving to and fro in the lower Belly, which rustling up and down are not directed to the lower Part of the Womb, (as all Throes in a true Labour) are no Signs that a Woman ought to be delivered. These Cholick Pains are dispersed by

by warm Cloths applied to the Belly, or carminative Glysters, whereas these augment the Pains in real Labour. These counterfeit Pains may sometimes proceed from a *Diarrhea*, or the Paroxysm of a Fever.

The true Signs which precede a Natural Labour, and happen within a few Days before, are unusual Pains in the Reins, the Rising of the Belly which was above falls down, which makes the Woman walk with more Difficulty than before, and stimulates her to Urine, because the *Fetus* bears down on the Bladder: Lastly, a Flux of glairy Humour from the Womb, which humects the Parts, and dilates the Passage of the Infant.

The Signs which accompany Labour are great Pains in the Back and Reins, which redoubling by Intervals, terminate at the Bottom of the Belly with repeated Throes. The Woman has a fuller, quicker, and higher Pulse than ordinary; her Face is red, and inflamed by the vehement Efforts she makes to help the Birth. The Natural Parts are tumefied, because the Infant struggles to get out; and if Vomiting supervene, it is a Sign that the Child will soon be born. This Vomiting arises from a certain Sympathy between the Womb and Stomach, because of the Communication of Nerves between those Parts.

When the Delivery is near, there happens an universal Trembling, especially in the Thighs and Hamms, a general Heat, and the Humours which then come away are often tinged with Blood. The internal Orifice of the Womb is open, which may be felt with the Finger, and the Membranes containing the *Fetus* present themselves: These appear harder and tenser, according as the Pain is more or less vehement. The Pains continuing, the Membranes break, and the Waters come away, and the naked Head of the Child presents it self to the Orifice.

When all or most of these Signs appear, it is certain that the Woman is near her Delivery, whether she have compleated her Term or not.

The OPERATION.

When you perceive by the above mentioned Signs that a Woman is really in La-

bour take Care that neither her Cloaths or any Thing else be about her Belly, which may streighten it, and give her some pretty strong Clysters before the Child be in the Passage, to evacuate the *Rectum*, and provoke the Woman to go to Stool. After this make a Bed for her, if it be Winter near the Fire. The Bed ought to be so placed, that you may commodiously go round it.

If the Woman be full of Blood, take away some of it when the Pulse rises. This Practice is useful to free the Breast, to assist Respiration, and prevent a great Loss of Blood or Fever after her Delivery. Then let her take some good Broth, or a new laid Egg, and let her walk in her Chamber, and from Time to Time take a Spoonful or two of Wine not too strong, because all heady Wines, and strong Liquors, are apt to kindle a Fever. When her Pains take her, advise her to help her Throes.

The Artist ought from Time to Time to feel the internal Orifice of the Womb, to discover whether the Waters are not ready to break, which so soon as he perceives, he must anoint the Place with some emollient Oil or Grease, and keep near the Patient, to observe all her Motions, Complaints and Pains, to make a Judgment whether her Delivery be near, without being obliged so often to try the Parts. Let the Patient ever and anon rest on her Bed to recruit her Strength, but she must not be suffered to lie on it too long, especially if it be a low Pallet Bed, because by Walking the Weight of the Infant dilates the internal Orifice of the Womb, and the Pains are more vehement and frequent: On the other Hand, she must not be too much fatigued in her first Pains, for fear her Strength be exhausted too soon.

When the Waters present, let them break of themselves if the Labour be natural, because if you should break them before her Delivery, the Passage would be dry, and more difficult for the Infant to slip through. After the Waters are broken, introduce the Finger into the internal Orifice of the Womb, to try if the Head of the Child present it self, which may be known if it be hard, thick, round, heavy, and equal; for all other Parts would be rough and unequal, hard or soft, according as they differ.

For the delivering the Woman, place her on a Bed covered with a Quilt, and not a Feather-bed, with Linen several Times doubled, to receive the Blood and Waters, (which come in great abundance from her) and prevent their incommoding her. The most convenient Posture to place her in is on her Back, with her Head and Breast a little raised, so that she be neither lying nor sitting; for in this Manner she will be able to breathe more easily, and have more Strength to help her Pains, than if she were otherwise, or sunk in her Bed. Being thus placed, she must spread her Thighs abroad, folding her Legs a little toward her Buttocks, which must be raised by a small Pillow underneath, to the End that the *Coccyx* or Rump Bone may give back. Lastly, She must have her Feet stayed against some firm Thing, and hold some of the Assistants by the Hand, that she may better stay her self during her Pains. The Woman must be encouraged to hold her Breath, and bear down her Pains as well and as strongly as she can. Here I must condemn the Practise of some Midwives, who press the superior Parts of the Belly, to thrust the Child gently down: This bruises the Womb, and hinders the Delivery. The Artist ought to content himself (having first anointed his Hand with some Oils or Greases) to dilate the inner Orifice of the Womb, putting his Fingers up into its Entry, and spreading them in the Time of her Pains, thrusting by little and little the Sides of the Orifice towards the hinder Part of the Child's Head.

When the Head begins to advance, the Artist must seat himself conveniently to receive the Child, and with his Fingers Ends endeavour to put back the inner Orifice of the Womb over its Head, and as soon as it is advanced as far as the Ears, or thereabouts, take hold of the two Sides with his Hands, slipping his Fingers under the Jaws, and upon the first great Pain which comes, draw it forth. Here let him take great Care that the Navel-string be not entangled about the Neck, or any other Part, lest thereby the After-burthen be pulled with Violence, and with it the Womb to which it is fastened, and so it cause a Flooding, or break the String. It must also be observed, that the Head be not drawn forth strait, but moving it to

and fro, that the Shoulders may more easily make their Way; and this must be done without losing Time, lest the Head being past the Child be stoppt by the Bigness and Largeness of the Shoulders, and so be suffocated in the Passage. As soon as the Head is born, he may slide his Fingers under the Armpits, and draw out the rest of the Body.

When the Child is drawn forth, place it on its Side, with its Face towards you, lest the Blood and Waters which follow immediately after should incommode it; or it may choke it by running into its Mouth or Nose, as they would do if it were laid on its Back.

If the Woman's Pains continue after the Birth, and her Belly be big, and putting your Hand into her Body you find another Gathering of the Waters, it is a Sign there is a Child still remaining in the Womb. If this be so, you must not endeavour to fetch away the After-birth till the Woman be delivered of all her Children, (because Twins never have but one Burthen, to which there are fastened as many distinct Strings and Membranes as there are Children) and if it should be drawn forth after the Birth of the first, the rest would run a Risk of losing their Lives, and besides it would endanger a Flooding.

For this Reason let the first String be cut, (being first tied with a Thread three or four Times double) and fasten the other End with a Thread to the Woman's Thigh, to prevent the Inconvenience it may cause by hanging between her Legs; and when this is done, break the Membranes of the Child which remains in the Womb to let out the Waters, and draw it out of the Mother's Body, observing the same Circumstances as in the first, after which fetch away the After-birth in the following Manner.

How to fetch away the After-burthen.

When the Child is born, the Artist taking the String must wind it once or twice about one or two Fingers of his Left Hand, (for Instance, the fore and middle Finger join'd together) the better to hold it; or he may take it in his Left Hand, wrapping it in dry Linen, to prevent it from slipping between his Fingers: Having done this, let him draw it
mo-

moderately, and with the Right Hand take another Hold of it above the Left near the Privities, drawing likewise with that very gently, resting the while the fore Finger of the same Hand extended, and stretched forth along the String towards the Entry of the *Vagina*, always observing to draw it from that Side where the Burthen cleaves least. In performing this, he must avoid the Membranes of the Infant, which sometimes hang out after the Birth, and investing the String, hinder him from keeping it firm. But above all Things, let him be careful to draw the Burthen gently, for fear of breaking the String, or drawing down the Womb with it, or causing a Flooding, which would be of dangerous Consequence. In the mean Time the Woman may blow strongly into her Hands, shut or stop her Nostrils, or she may put her Finger into her Throat, as if she would excite Vomiting, or else strive as if she were going to Stool, bearing down and holding her Breath, all which Motions have the same Effect, and serve to loosen the Burthen, and facilitate its Expulsion. If this do not suffice, after you know on which Side the After-birth is situated, bid an experienced Nurse-keeper press the Belly lightly with the Flat of her Hand, bringing it gently downwards by Way of Friction. When the Burthen is come away, it must be considered whether it be entire, and if the least Part remain behind, so much as the Skirts, or any Clods of Blood, the Hand must be put up into the Womb to bring them out.

When the String is broke, and the *Placenta* is retained, you must speedily introduce your Hand into the Woman's Body, and before the Womb can close (having first anointed it with some Grease or Oil, and pared your Nails close) bring it away. This is easy to be done, if it does not cleave to the Womb; but if it does adhere, you may easily distinguish it from the Womb it self, by the several Inequalities in its Surface, and then by trying with your Fingers on which Side it cleaves least, begin to disengage it there, thrusting the End of your Fingers between it and the Womb, continuing so to do till it be entirely freed, and then gently draw it out. You ought to be careful in separating the Burthen, to avoid scratching of the Womb, for fear of a Flooding, Inflam-

mation or Gangrene, and it is better to leave some Part of it behind, than endanger such Accidents.

If the Womb be not open enough to receive the Hand, anoint the Woman's Privities, and introduce two or three Fingers, with which apprehend that Portion of the Burthen, which almost always presents it self at the internal Orifice, and draw it gently, and a little obliquely on one Side and the other, and so proceed forwards, keeping what you first seized in its Membranes.

If all these Methods fail, and you cannot fetch it then away, you must have Recourse to Injections made with Decoctions of *Mallocks*, *Marshmallows*, *Pellitory*, *Linseed*, with the Addition of Oil of sweet *Almonds*, *Lillies*, or a Bit of fresh *Butter*: These injected into the Womb are proper to suppurate, and so bring it away. Strong Clysters are very serviceable, because the Patients striving to go to Stool, very much assists the Expulsion of the Burthen.

Bleeding in the Foot or Arm is necessary as Occasion requires to prevent a Fever; but if the Woman be free from it, good Restoratives may be given her, as Broths made of Veal or Poultry, with a little Juice of Orange, or Wine and Water.

Of difficult and unnatural Labours.

You may be assured the Child is living if the Woman has received no Hurt, if she has labour'd under no very great Inconvenience during the Time of her going with Child, if she has enjoyed a good Health, and finds the Infant stir within her.

If you doubt whether the Child be alive after the Waters are broke, pass your Hand gently up into the Womb, and take hold of the String as near the Navel as may be, to feel the Pulse of the Umbilical Arteries, or put the Tip of your Finger into its Mouth, to feel the Motion of the Tongue.

You may conclude the Child to be dead, if he has not stirred for a considerable Time; if there be a Flux of fetid Matter from the Womb, if the Woman feels great Pain and Weight in her Belly, if the Womb be not stay'd, but falls like a Ball from one Side to another, on which ever Side she happen to lie;

lie; if she have frequent *Syncope*s and Convulsions; if the Navel-string or Burthen have for some Time been out of the Mother's Body; if (putting the Hand into the Womb) the Child be cold, the Navel have no Pulsation, and the Tongue remain unmoved; if the Head feel soft, and the Bones move to and fro, riding over one another in the Sutures; if the Woman has received any Hurt, or lost a great Quantity of Blood, or she be not arrived at her due Term; if the Waters have been broke for a considerable Time; if her Face be of a leaden Colour, her Eyes sunk, her Looks faint and dejected, her Breath ill scented, her Breasts decay'd, her Belly fallen, without any Waters coming away from the Womb. If divers of these Signs happen together, there is good Reason to believe the Child is dead.

When the Child presents with the Feet first.

When this happens, the Artist must introduce his Fingers into the Womb to dilate it by spreading them. When the Passage is wide enough, introduce your Hand into the Womb; and if only one Foot present, consider well whether it be the right or the left, and so you may better judge on which Side the other Foot lies, which you must search for, and so draw forth both together. But before you proceed thus far, you must be well assured that this is not the Foot of another Child; for you would sooner kill both Mother and Children, than deliver her after this Manner. You may easily prevent Mistakes of this Kind, by sliding your Finger along the Leg and Thigh to the Twist, till you find the two Thighs joined to one Body; and this Way has this Convenience, that at one and the same Time you find the other Foot, in order to bring it away with the former. When one Foot is found, tie it with a Riband, that so you may not lose that again in searching for the other. When both Feet are found, taking them with both Hands above the Ankles, and holding them close together, draw them till the Thighs and Hams of the Child are come forth: As soon as the Knees are come out, take hold of the Thighs above them, wrapping them in a Napkin, to prevent the Hand from sliding, and then proceed to draw the Child

to the upper Part of the Breast. Then bring down the two Arms of the Child on the Sides of the Body, taking hold of his Hands near the Wrist, rather than in any other Place. This is the best Way to disengage them in the Passage, and here Care must be taken to prevent breaking them by forcing them too much. You must be careful the Child's Belly and Face be downwards, to prevent the Chin from stopping on the Sharebone; wherefore if it be not in this Posture, you must reduce it, which may easily be done. To effect this, slide the Flat of one Hand to the *Pubes* of the Child, and with the other hold the two Feet, turning the Body till the Breast and Face be downwards: Having in this Posture brought the Child to the Shoulders, you must proceed to draw it out, in the mean time advising the Woman to bear down, that the Head may succeed in the Place of the Shoulders, and not stop in the Passage.

When the Head stops in the Passage.

In this Case, put the Child's Thighs into the Hands of some one of the Assistants to draw gently, whilst you by degrees disengage the Head from the Bones of the Passage. To do this, slip one or two Fingers of your left Hand into the Child's Mouth, to disengage the Chin, and with your right Hand embrace the hinder Part of its Neck above the Shoulders, and so draw it out above. This must be done as promptly as is possible, for fear the Child be suffocated.

If the stopping of the Child's Head in the Passage arise from its ill Position, turn the Face downward, sliding the Flat of the Hand over its Face to cover its Inequalities, for the more easy turning and putting it into a more commodious Situation; but the Head and Body must be turned together, for fear in turning one without the other, the Child's Neck be twisted round. After these Circumstances observed, the After-birth must be fetch'd away as before.

How to fetch away the Child's Head when it is separated from the Body, and remains behind in the Womb.

If the Head be small and soft, as in Abortions, it may be easily drawn out; but if it

be big, the Artist must put his right Hand up into the Womb, and search for the Mouth, and putting one of his Fingers into it, and his Thumb under the Chin, take hold of the lower Jaw, and draw it out.

But if the lower Jaw come off from the Head, he must draw his right Hand out of the Womb, and slip in his left, and with this stay the Head; and in his right, he must take a straight strong Hook or Crotchet with one Branch, and slide it all along the Inside of his Hand, keeping the Point towards it, for fear of hurting the Womb. Having introduced it in this Manner, he must turn it to the Head, and strike it into one of the Eyes, or Holes of the Ears or *Occiput*, or between the Sutures, and so bring away the Head, making way for it with his left Hand. When he has brought it near the Passage, he must withdraw his other Hand, which would be apt to hinder its coming away; however, he must leave two or three of his Fingers on the Side of the Head, to prevent the Womb's being wounded by the Instrument, if it happen to lose its Hold.

If the Artist decline using the Crotchet, he may take a Fillet of soft Linen, three Quarters of an Ell long, and three Inches in Breadth, folded double; let him hold the two Ends with his left Hand, and the Middle with his right, being first anointed with fresh Butter; let him introduce the End of this Fillet into the Womb, and pass the Middle over the Child's Head; then drawing the two Ends of the Fillet together, let him bring the Head out.

If these Means fail, the Artist must thrust his left Hand into the Womb, and then slide in a crooked Knife with his right, with the Point turned toward his Hand, for fear of wounding the Womb. When it is in, he must turn it to the Head, and make an Incision in that to evacuate the Brain, and lessen its Bigness. The Knife must be thrust in with the left Hand, to prevent hurting the Head, and must be small with a long Handle. If the Burthen be loosen'd from the Womb, it must be brought away first of all; on the contrary, if it adheres firmly, the Head must first be drawn forth.

When the Child's Head thrusts the Neck of the Womb out before it.

When this Accident happens, the Woman must not be obliged to walk or stand up, but must be kept in her Bed with her Body lying even, and not so much raised as in a natural Labour. You must omit giving sharp Clysters, and all such Things as may moisten and relax the Womb; and when the Child thrusts forward, the Artist must have one Hand on the Side of the Head, to put back the Womb to its proper Place, continuing to do this till the Child be born, without drawing the Head as in natural Births. But if the Child be stop'd in the Passage, and be in Danger of being suffocated, he must draw it gently out by the Head, whilst some other Person thrusts back the Womb with his Hands; and when this is done, he must fetch away the *Placenta*.

When the Child's Head comes first, and cannot come forth, because it is too big, or the Passage not sufficiently dilated.

In this Case, the bearing Part must be softened and relaxed by Oils and Emollient Greases, and all Endeavours used to bring the Child into the World. If these prove useless, and it be certain that the Child is dead, the Artist must no longer scruple to fix his Crotchet into the Head, and so bring it out. Before this be done, let him introduce a Catheter well oiled into the Bladder, to evacuate it, putting the Child's Head a little aside, for the more easy slipping it in. After this, let him slide the Flat of his right Hand into the Entry of the Womb to the Side of the Child's Head, and with the left let him introduce a Crotchet, which ought to be short and strong, and in entering it must be turned to the Inside of the right Hand. After it is in, let him turn it and strike it into the Middle of the Parietal Bone, and draw it gently till it has taken fast hold; then let him take out his right Hand, and introducing his left Hand to guide it, fetch it out with the Instrument. If there be Occasion, the Artist may use another Crotchet to the opposite Side of the Head,

Head, to draw the whole more equally. In the last Place, (drawing out his Instruments) let him take hold of the Head with both his Hands, to bring out the rest of the Child's Body.

When the Child presents the side of the Head or the Face to the Birth.

To prevent the Child's advancing farther in this Vicious Posture; let the Woman lie down, and cause her to lean a little on the opposite side, to the Child's ill Position, then let the Artist slide up his Hand to the side of the Child's Head, to bring it Right. If this do not succeed, he must put his Hand up to its Shoulders, that so thrusting them back a little into the Womb, he may give it a Natural and Convenient Situation, after which he may proceed to deliver the Woman in the usual Manner.

If this succeed not, let him search for the Feet, and bring them out first.

When the Child's Head is Born, and the Body stopt in the Passage by the Shoulders.

Draw the Child's Head gently, sometimes by the Sides, sometimes taking it with one Hand under the Chin, and with the other on the Top of the hinder part of the Head, alternately drawing one side and the other to facilitate the Birth. If the Shoulders cannot pass, slide one or two Fingers of each Hand under the Armpits, and so draw out the Child. If it be stopt by a Hydropick Belly, introduce the Left Hand into the Womb, quite to the right sight of the Belly, and pierce that with a Crotchet, (for the introducing which, you may make use of your Right Hand) and when the Waters are let out, bring away the Child.

When the Child comes with one or both Hands together with the Head.

As soon as this ill Position of the Child is perceived, it must be prevented from proceeding farther. The Woman must be placed on her Bed, with her Hips raised a little higher than her Head, and the Artist must put back the Child's Hand, guiding it as much as may be, to give way to the

Child's Head, which having done, if the Child's Head be on one side, it must be reduced to its Natural Posture in the middle of the Passage, and so brought away as in ordinary Births.

When the Child presents one or both Hands foremost.

The Hand or Arm must be thrust as speedily as may be into the Womb, and the Artist must introduce his Hand under the Child's Breast and Belly, so far, till he finds the Feet, which he must gently pull towards him to turn it, and draw it forth, observing to do this with as little Violence as may be.

In introducing the Hand into the Womb, observe to slide it within the Membranes, that so it may turn more easily without hurting the Womb.

If the Arm come too far out, and cannot be put in without great Difficulty, by reason of its Bigness, and it be certain the Child is Dead, it is then advisable to take it off as high as is possible, beginning with an Incision around it, and cutting through the Bone with sharp Pinchers, as is practised by *Ambrose Parré*. But I think it better to twist it once or twice round; for by this means it will easily separate from the Body in the Articulation, and there will be no danger of hurting the Womb by the Asperities of the Bone.

When the Child presents Feet and Hands together.

When the Womb is sufficiently Dilated, let the Artist slide his Hand into it far enough to reach the Child's Head, and put back that together with the Hands, to the bottom of the Womb, leaving the Feet in the same place where he found them, to draw the Child forth by.

Observe that whenever the Child, or any part of it, is to be thrust back into the Womb, the Woman must have her Hips raised.

When the Child presents with the Knees first.

It must not be suffered to advance far in this Posture, wherefore having placed the Woman aright, put back the Child's Knees,

and to unfold its Legs, put one or two of your Fingers under the Ham, directing them by little and little all along behind the Leg, until you reach the Foot, that to having disengaged one, you may do the same to the other, proceeding in the same Manner as with the first; after which, having brought both together, deliver the Woman in the same Manner as when the Feet present first, observing to bring the Face of it downward, and such Circumstances as are noted where we treat of that Labour.

When the Child comes with the Shoulder, Back or Breech.

The Artist must thrust the Shoulder a little back, that so he may have the more liberty of introducing his Hand into the Womb, then sliding it along the Child's Body, on the Belly or Side, as he finds it easiest, and searching for the Feet, he must turn it and bring them to the Passage, and to deliver the Woman.

If the Back present, he must slide his Hands along it towards the lower part, till he finds the Feet, and then draw it forth, as if it presented with the Feet first.

If the Child come with the Breech first, he must gently thrust it back, and sliding up his Hand along the Thighs to the Legs and Feet of the Child, he must bring them gently one after the other forth of the Womb, by folding, stretching, turning and drawing them gently towards the side on which it comes easiest, being careful not to wind them too much, or cause a Dislocation, and then let him draw forth the rest of the Body, as if it came with the Feet foremost.

If the Child's Buttocks happen to be so far engaged in the Passages, that it is impossible to thrust it back, the Artist must draw it out in this Situation, by sliding one or two Fingers of each Hand on each side of the Buttocks to make this way to the Groin, with as little Violence as may be, and then having crooked them inwards, let him draw the Breech just out to the Thighs, and so by drawing and wagging from side to side, he will disengage them from the Passage, as also the Legs and Feet one after another,

(being careful not to Dislocate any part) and then he may extract the rest as before, when coming with the Feet.

When the Child presents Belly, Breast or Side.

When the Child presents the Breast or Belly, let the Artist slide gently the flat of his Hand (being first well anointed) towards the middle of the Child's Breast, and thrust that back to turn it, then let him slip up his Hand under the Belly till he finds the Feet, and bring them to the Passage to draw it forth, observing always to turn it, so that the Breast and Face may come downwards.

When the Child presents the Side, the Artist must thrust back the Body of the Child, and introduce his Hand into the Womb, sliding it along the Thighs till he has found the Legs and Feet, and then turn it and draw it forth.

If several Children present to the Passage together, the Artist must carefully heed which Member belongs to each Child, for fear he draw them both at once; if two or three Feet come forth, let him take two, viz. one Right and one Left, and slide his Hand along the Legs and Thighs up to the Twist, if forwards, or to the Buttocks, if backwards, to find if they belong to the same Body, and when he is certain of this, let him thrust back the Foot of the other, to facilitate the Passage, and draw forth the nearest, observing the same Circumstances as when the Child presents with the Feet first, remembering likewise not to fetch away the Burthen, till the second Child be Born; for sometimes there is but one common *Placenta* to both Children, which being separated from the Womb, would cause a great Flooding, and be apt to incommode the Operator, nor can any remedy avail to remove this, till the Woman be delivered of both her Children.

When one Child is come away, the Artist must tie the Navel-string and cut it, and after that is done, bring away the other Child by the Feet, and fetch away the Burthen as in a Natural Delivery.

If the Child present any other part besides the Feet, the same Method must be used, which

which is above directed in each different Situation, observing to draw forth that which is farthest advanced in the Passage.

When the first Child is come away, and the Waters of the second are not broken, the Membranes must be torn with the Fingers to let them out, because the Passage being dilated by the Birth of the First, the Second will come away without any difficulty.

When the Navel-string comes first.

Let the Woman be laid very warm in her Bed, and the String replaced in the Womb as soon as is possible, to prevent its cooling. The Artist must endeavour to put it back behind the Child's Head, and keep it there with his Fingers till the Head be fully come forth, which will hinder the coming down of it again.

If it be necessary to draw the Hand out of the Womb before the Head be past, let him put a very fine Rag between the Head and the side of the Womb, to stop the place where the Navel-string passed, leaving one end of the Rag without, to draw it out when he pleases; and let a Compress dipt in Wine well warm'd be applied externally to the Womb, to defend the Navel from the injuries of the external Air.

But if the String yet come forth upon every Pain, then without further delay let the Artist bring the Child away by the Feet, which he must search for, though it should come with its Head; and let him gently thrust that back, provided it be not too far advanced; for in this Case it cannot be done without great Violence, Pain and Hazard of the Womans Life.

To search for the Feet, let him slide his Hand on the Child's Breast and Belly, and when he has found them, turn the Child and draw it out.

When the Burthen presents first, or is come away before the Child.

When the Placenta presents first, nothing can be felt but a soft Body; there is a Flooding and concentered Blood comes away, and the Woman Faints.

When this happens, the Woman must be delivered with all Expedition, and if the Membranes are not broken, the Artist must put a little on one side that part of the Burthen which presents, and break the Membranes with his Fingers, and let out the Waters, and turn the Child at the same time, if it be in any other Posture than with the Feet foremost, and draw it forth immediately.

But if the Burthen be almost come forth, and the Membranes broke, he must bring away the Placenta before the Child, not amusing himself with tying and cutting the String before he draws out the Child, to prevent losing one moment of time in delivering the Woman, because the Infant is in great danger of losing its Life, and the Mother has a continual Flooding.

When there is great Floodings and Convulsions in Labour.

The best Remedy in this case, is to deliver the Woman immediately, without the least Delay, fetching away the Child by the Feet; if the Flux of Blood be very Moderate, and nothing else requires it, you must not forward the Labour, and the Woman may go out her Natural Term.

If the Membranes are not broke when the Flooding appears, they must be torn as soon as the Womb is a little Dilated, because the Burthen is fixed to those Membranes, and these being extremely agitated and moved by the Pains of the Mother, the Placenta must consequently be moved, and a Flux of Blood entue. If a Conclusion happen, the Woman must be delivered immediately. This is the best expedient in this Case, for the saving the Lives of both Mother and Child, if the Womb be open; but if it be not, then let the Artist have recourse to the usual Remedies; for instance, Bleeding in the Arm or Foot (if the Accident arise from Repletion) giving Ineezing Medicines or Clysters to caule Throes and dilate the Womb, in the mean while humecting it with Emollient Fomentations.

To deliver the Woman, let the Waters be broke, and the Child drawn out by the Feet, unless its Head be engaged in the Passage, and then fetch it by that. If the Child be certainly

certainly Dead, let it be drawn out with the Crotchets, as was before directed.

When the Child is Hydropical or Monstrous.

If the Dropsie be in the Head, let the Artist gently introduce his Left-Hand, on the right side of the Child's Head, which he will perceive to be very Big, and the Sutures separate from each other; when he finds this, let him with his Right-Hand slide a crooked Knife all along the inside of his Hand, with the point turned towards his Hand, for fear of hurting the Womb, and having conveyed it very near the Head to the place of the Sutures, turn it in that place, and make a sufficient Aperture to let out the Waters, and draw forth the Child. The same Method may be used to let the Water out of other tumefied Parts.

But if the Child be of any Monstrous Figure, or too big, or two grow together, they must be dismember'd, without which it is impossible to fetch them out of the Womb. To perform this, let the Artist introduce his Left-Hand into the Womb, and conveying in the crooked Knife to the Parts he intends to separate, let him cut them off, as near the Joynt as possible. If two Bodies are joyned together, let him separate them in the place of their Cohesion, and draw out one after the other by the Feet.

When the Infant is dead in the Womb.

Give strong Clysters to the Woman to excite her Throes, and then deliver her as soon as is possible. In order to this, evacuate the Bladder of its Urine, and if the Child present with its Head first, thrust it back, and introduce the Hand into the Womb, sliding it under the Child's Belly, and search for the Feet, and turning it by them, draw it forth, as we have so often directed. But here the Artist must have an especial care that the Head do not remain behind, because the Child is most commonly Rotten; and when this happens, it must be drawn out in the manner above directed.

If the Head be too far advanced in the Passage, it may not be thrust back for fear of doing Violence to the Womb, but the Child must be drawn forth fixing Crotchets in his

Head, and proceed after the manner we have elsewhere described.

If the Dead Child present an Arm, bring it away from the Body by twisting it once or twice round, and do the same in other parts of the Body; and after the Child is thus brought away, collect all the parts of the Body, and compare them to see if any be Missing. Observe here to avoid using Crotchets, though you are certain the Child is Dead, if it can possibly be brought away by any other means; because the Assistants and Midwives are most commonly very Cenforious in this Case, and will not fail to impute the Child's Death to the Artist.

Of a Mole and False Conception.

A Mole is a Mass of Flesh without Bones, Joynts or Distinction of Members, or any regular or certain Figure, Moles have no Burthen or Navel-string, but adhere to the Womb, and draw Nourishment from it, and are sometimes contained in Membranes. If Women cast them before the second or third Month, they are commonly called false Conceptions, and Moles if they are retained in the Womb for a longer time, and grow larger.

There is little difference in the Signs, to enable us to distinguish between a Mole and false Conception; except that the Belly in Women, who have Moles, is harder and more painful, and appears equally extended on all Sides, not rising to a point before, and tumefies sooner than if she were really with Child. Moles are void of Life and Motion, are not encompassed with Waters, and attended with more Inconveniences, than a Natural Conception, and the Woman has no Milk in her Breast, tho' she can press some Serosities out of them.

When you are assured the Big-belly do's only proceed from a Mole, try to bring it away as soon as is possible, giving the Patient some Purgative Medicines, in case there be no Fever or Flooding; and when these begin to Operate, give a sharp Clyster to excite her Throes, and when the Womb begins to dilate, relax it with Grease and Emollient Oils. Bleeding in the Feet, and half Baths are very serviceable in this Case.

If a Mole be not too large, or adhere too firmly to the Womb, it will come away without the Assistance of any Remedies; but if it cleave strongly, or be exceeding Large, when the Womb is sufficiently dilated, the Artist must slide in his Hand and fetch it out, or make use of a Crotchet, or sometimes a Knife, to divide it into Pieces.

If the Mole cleave to the Womb, he must separate it from the part with his Fingers, which he must by degrees insinuate between them, beginning in that place where it adheres least, and proceeding till it be entirely loosened, having great care to have his Nails paired close, for fear of hurting the Womb.

If it be a False Conception, slide one Finger into the Womb, and bend it on one side and another, till you can enter a Second and a Third, or a Fourth, and then taking it between the Fingers, fetch it away together with the concremented Blood; and if no Portion happen to remain behind, the Flux of Blood will soon cease. But if the Orifice be so small, that the Artist cannot possibly introduce more than one Finger, let that be the Forefinger of the Right Hand, and let him thrust that as far as he can, and turn it about to loosen the false Conception from the Womb, and bring it away with the Finger; and if he cannot do this, let him make Injections into the Womb to suppurate it. The Flooding will undoubtedly cease, if no part of the Conception be left behind: But if the Internal Orifice cannot be more Dilated than is mentioned, and the Flooding be so violent as to endanger the Womans Life, the Artist having introduced the Fore-finger of his Left-Hand, must take with his Right a Cranes Bill or Forceps, and sliding this along his Fore-finger, extract the Unnatural Body in the Womb, taking care not to pinch the Womb it self, which he may prevent by guiding the Instrument with his Finger.

What is fit to be done to a Woman newly laid, and her Child.

THE DRESSING OF THE MOTHER.
When a Woman is Delivered, lay to her Privities a Closure of Linnen six or seven times doubled, to prevent the cold Air from

entering her Body, which would shut the Vessels, stop her Cleansings, and create bad Accidents; as Fevers, Pleurisies, Inflammations, &c. Let her Bed be well warmed and covered with Clothes several times doubled, which must be changed upon account of her Cleansings, but first those must be removed, which received the Child in her Labour. As for her Posture, place her in her Bed with her Head and Body a little raised, to give way for her cleansing and free breathing, and let her pull down her Legs and Thighs close by one another, with a little Pillow under her Hams; and let her lie on her Back, that so the Womb may resume its Natural Situation. After the Closure is removed, let an Anodyne Cataplasim be applied, made of two Ounces of Oyl of Sweet Almonds, with the Whites and Yelks of two New-laid Eggs, beat and stirred together with a Spoon over some warm Embers, till it be of a due Consistence. Let this Cataplasim be applied hot, and continued on for the space of three or four Hours, renewing it if there be occasion; it appeases pain in the bearing part after Labour.

In the next place make a Decoction of Barley, Linseed, Chervil, Marsh-mallows, and Violet-leaves, and with this foment the part three or four times a Day, for the space of five or six Days together, to cleanse the Privities from Clods of Blood, and other Filth which proceed from the Cleansings.

Nurse-keepers lay a Compress of a Triangular Figure, four or five times double on the Belly, to bear up the Womb as they pretend, and two others rolled up on each side, to keep it directly in the middle; then lay a square Napkin all over the Belly, and after that Swathe it with another Napkin three or four times double, and about a quarter of an Ell broad. But the Belly ought by no means to be compressed for the first fifteen Days, and if it happen to be so, the Bandage must be removed, to anoint it well with Oyl of Sweet Almonds, but after that time it may be a little streightned, to contract and keep the parts together.

If the New-laid Woman intend to Suckle her Child, lay a soft and fine Cloth on her Breasts to keep them warm, and prevent the Milk from Curdling. If the Milk begin to come too plentifully into them, embrocate

cate them with a mixture of *Oyl of Roses* and *Vinegar*, and lay on them a fine Compress dipt in it.

After the Cleansings are finished, strengthen the Womb with a Decoction of *Provence Roses*, and *Roots and Leaves of Plantain* in *Smiths Water*. After that use this astringent Lotion to close the Parts. R *Pomgranate Peel*, *Cypress Nuts*, à ziss *Seal'd Earth*, ʒss. *Provence Roses*, ʒi. *Roch Alum*, ʒij. Infuse these Ingredients for the space of a Night in five half pints of Claret alone, or diluted with *Smiths Water*, (lest the Wine alone be too sharp) boil all till it be reduced to a Pint, then strain it, and express it strongly, and with this foment the Parts well Night and Morning.

THE DRESSING OF THE CHILD.

Put the Child into a warm Blanket, and take a brown Thread four or five times doubled, of a quarter of an Ell long, with a knot at each end to prevent its entangling. This Thread and a pair of Scissars, must ever be in readiness against the time of Labour; then tie the Navel-string with this Thread about a Fingers breadth from the Belly, and make a double knot, then turning the Thread round the Navel, make two other knots on the opposite side, and so cut the string about a Finger's breadth more beyond the Ligature towards the *Placenta*. The Ligature must be so close that no drop of Blood may pass it, but not so strait as to cut the Navel.

The end of the Navel must be wrapt round with a small Rag, dry or dipt in *Oyl of Roses*, and another doubled Rag laid on the Belly on the upper side, to repose the Navel on with a Compress over this, and these lesser Dressings kept on with a Swathe of three Inches broad, roll'd round the Body. The Navel-string dries and separates near the Belly, within five or six Days or thereabouts.

Let the Child's Body be cleansed with *Wine* and *Warm Water*, especially the Head, Groin and Armpits, and wiped with soft Rags, or a Sponge dipt in *Wine* Lukewarm, or if the Excrements be very tenacious, in *Oyl of sweet Almonds*. Let the Nostrils and Ears be unstopt with little Tents, and the Eyes wiped with a soft dry Rag.

When the Child's Body is cleansed from all the adhering Filth, view it well to see if no part be dislocated, and all the Passages be open for the voiding its Excrements; and if they do not come away, give him by the Mouth some *Syrup of Violets* or *Roses*.

After the Child is cleansed, cover his Head with a little Linen Biggen, with a Wollen Cap over that, but observe first to place a Compress on the openness of the Sutures, and pin it without. Behind the Ears put Rags to dry the Filth, and then lay other Rags on the Breast, and in the Folds of the Armpits and Groin, and so Swathe him in his Linen and Blankets well warmed, binding him lightly on his Breast and Stomach. The Arms and Legs must be wrapt in the Blanket, and kept straight lying by each other, with a little of the Blanket between to prevent them from Galling, by rubbing against each other, and the Head must be kept steady with a stay fastned on each side the Blanket.

How a Woman ought to govern her self during her being with Child.

The Air in which she breaths must be Temperate, and if it be not so by Nature, it must be reduced to due temper by Art, warming if it be too cold, or cooling it if too hot.

A Pregnant Woman ought to shun too warm an Air, because it weakens and enfeebles the Body; on the other Hand, she must with equal Care avoid an Air which is Cold and Foggy, which may cause Rheums and Coughs, which putting her Body into an Agitation, may make a Concussion of the Womb, and cause an Abortion. She ought not to live in strait narrow Lanes or Allies, or near Common-Sewers, or other stinking Places, because ill Scents will make her apt to Miscarry. She must avoid the noxious Fumes of Charcoal, especially when not burnt in a Chimney, and also all Perfumes and other sweet Scents, especially if she be Hysterical.

If a Pregnant Woman has a longing after odd Things, she must be indulged, though perhaps the things she desires are Improper, provided she eat Moderately. But if she have no extravagant Appetite, let her eat

any sort of wholesome Meats, in such quantity as may suffice for the Nourishing her Self and Child, in which her Appetite is to be a Rule. Fasting, or long Abstinence, is Hurtful, because it heats the Blood, and conveys ill Nourishment to the Child, which renders it Weak, and Decay'd, and often makes it struggle to free it self before it's Time, and seek for better Food. On the contrary, she must not eat too great Quantity of Meat, especially at Night, because the Womb in the last Months of going with Child, possesses a great part of the Capacity of the lower Belly, and hinders the Stomach from retaining much; and hence, when it is over-charged, it causes Belches, Indigestion, and difficulty of Breathing, proceeding from a Compression of the Diaphragm, which wants Liberty of Motion. Let her therefore eat little, and often, and let her Bread be of the best Wheat, White, and well Baked, and not Brown Bread, or baked Crust, which swells in the Stomach. Let her eat good Nourishing Meats, as the most Tender Pieces of Beef, Veal, Mutton, Lamb, Fowl, as Pullets and Fat Capons, or Partridge, Pigeons Boiled or Roasted, as she desires; New-laid Eggs are very good, and Pregnant Women seldom having good Blood, ought to put into their Broth such Herbs as purify it, as *Sorrel*, *Lettuce*, *Succory* and *Borage*. A Woman with Child ought not to eat no High Seasoned Pies, especially the Crust which is difficult to Digest; and if she eat Fish, it ought to be Fresh, and not Salted, and such as is bred in Rivers, and Running Waters, because Pond-fish usually tastes of Mud, and breeds ill Juices. She may drink at Meals a little good Old Wine diluted with Water. Red Wine is better than White, and strengthens the Stomach, helping Digestion, which is always bad in the time of Pregnancy. If she was not used to it before, she must gradually accustom her self to it, but must never have it cool'd with Ice, or any otherwise drink it too Cold, for cool Liquors are apt to breed the Cholick, and by consequence endanger Abortion. On the contrary, she must no less carefully avoid what is heating, such as all Salt, Sharp, Bitter, Aperitive and Diuretick things, which provoking the Courses, are apt to make a Woman Miscarry.

Women with Child are apt to have a sharpness of Stomach, to prevent which they must refrain eating of Fruits, Sallets, Sugar, and drinking of Wine, which extremely fowers all their Aliment, and lastly keep their Bodies Soluble.

Women with Child must have Moderate Sleep, that is Eight Hours at least, and Ten at the most in the Night-time, and little or none at the Day-time. However, Women who are used to sleep in the Day-time, must be indulged in this bad Custom, rather than do violence to Nature, in breaking an ill habit too Abruptly.

As for Exercise and Rest, these differ according to the times of Pregnancy. For the first four or five Days after Conception, a Woman ought to keep her self in Bed, and decline the Embraces of her Husband. During all the remaining time of her going with Child, she must use no violent Exercise, must not go in any Coach, Chariot, or on Horse-back, because these Agitations of the Body are apt to loosen the *Fetus*, and if she have occasion to go Abroad, it must be in a Chair or Litter. She must not carry any great Burthen, or lift her Arm too High; and for this Reason she ought not to dress her own Head. The lifting of the Hands has caused many Abortions, because the Ligaments of the Womb are relaxed by these violent Extensions. Her Shoes ought to be Low-heeld, because the Rising of her Belly hindering her from seeing her Feet, she is apt to Fall.

If a Woman happens to Stumble, fall or hurt her Belly by any other Accident, and she find her self to void Blood, or a bloody *Serum*, or indeed any Water from the Womb, let her Repose her self some Days without seeing her Husband, till these Evacuations Cease, and she find no Pain in the Reins or Bladder.

In short, she must govern her self so in all Exercises, as to exceed in too much Rest, rather than Motion, because a much greater danger attends the one than the other; and when ever a Woman is advised to use Exercise to facilitate her Delivery, it must ever be understood to be very Moderate. A Woman with Child ought to abstain from the Embraces of her Husband, the two last Months before her Term, because in these

Careless, there is a great Agitation of the Body and Compression of the Belly, which often occasions a wrong Posture of the Child. A Woman with Child ought to have a presence of Mind, and to be prepared against all Surprizes which may happen, as Claps of Thunder, Firing of Cannon, and other sudden Noises, which Resolution is difficult to be obtained.

Women with Child are subject to a Constriction of the Belly, because the *Fœtus* presses on the *Rectum*, and hinders a free discharge of the Excrements; besides, there is usually in Women with Child a certain Heat of the Bowels, which disposes them to Costiveness. Let a Woman who is subject to this Inconvenience, eat *Poy'd Apples*, *Stew'd Prunes*, *New Figs*, *Mulberries*, *Honey with Bread*, *Rye-Bread*, *Veal-Broth*, &c. and take a Clyster of *Warm Water* frequently to humect and relax the Gut. Let her sometimes take clean *Cassia* $\frac{z\beta$. or *Veal-Broth* with the Emollient Herbs, and an Ounce of the best Honey. If these innocent Remedies are not sufficient, give her Mild Clysters, made of a Decoction of *Mallows*, *Marsh-mallows*, *Pellitory*, and *Anise-seeds*, with two Ounces of Brown Sugar dissolv'd in it, adding a little *Oyl*, or a Decoction of *Bran*, adding *Honey of Roses* with a piece of *Fresh Butter*, or any other thing as occasion Requires. But here be cautious not to give sharp Clysters, or any thing which may excite a *Diarrhœa*, and cause too great an Evacuation, because this will endanger an Abortion.

She must moderate her Passions, especially Anger and Jealousie; and care must be taken not to Surprize her with Fear, or the Relation of any Accident, which may affect her with extraordinary Grief. These Passions put the Spirits into a Disorder, and often cause Women to fall in Labour at that very Instant.

When a Woman finds or suspects her self to be with Child, she must not, as that Sex usually do's, wear Bodice with Whale-bone, for these hurt the Breasts, and compress the Belly, and often cause the Children to come before their Time, and sometimes Mithapen. These Nice Ladies out of Affectation of shewing a good Shape, spoil their Belly, which after they are Laid is full of Wrinkles,

because the Skin not having liberty to extend it self on all Sides, forces its way towards the Thighs, where being exceedingly stretched, it can never after regain its pristine State, but hangs down like a Purse, and this Folly sometimes causes them to have Ruptures. For this reason Big-bellied Women must have their Clothes loose without Buskins which compress the Belly, and the *Fœtus* in it. In the last place they must never bath for fear the Womb open, and an Abortion Ensue.

A Woman with Child if occasion requires may Bleed, but the Evacuation must be small, and there is no Regard to be had to the Time, provided the quantity be not too Large.

Of Vomiting in Women with Child.

A Woman has commonly an inclination to Vomit in the beginning of her Pregnancy, and at such times there is no great Apprehensions; but if this continue it weakens the Stomach exceedingly, and it is more apt to Corrupt, than digest the Food. These Vomittings continue till the third or fourth Month, which is the time the Child stirs most. After that time Women usually begin to regain that Appetite which they had lost the first Month, and this seems necessary, because the Child growing greater, requires a larger supply of Nourishment. Sometimes the Vomiting persists, and then the Woman is in great danger of Miscarrying, because these Commotions throw the *Fœtus*, lodged in the Womb downwards. Some Women are more afflicted with this Accident in the latter Months, than in the first, because the Stomach is compressed by the distention of the Womb. This Vomiting when it happens to Women, whose Children lie High, do's not cease till their Delivery.

You need not be concerned if a Woman Vomits in her first going with Child, if this be not attended with any extraordinary Straining, but if it persist after the fourth Month, some Remedy must be used; because the *Fœtus* growing Large, requires Nourishment as well as the Mother, and must necessarily be deprived of it, if she continues to cast it up, besides the Commotion

tion of the Body endangers an Abortion, or a Descent of the Womb.

This Vomiting cannot be stopt of a sudden, but must be abated and checked by Degrees, by taking good Sustainance, and eating but a little at a time, because the Stomach being repell'd by the Womb, the Meat Regurgitates. To this end let the Patient make her Meat Palatable with *Juice of Oranges, Limons, Pomgranates*, or a little *Vermouth* or *Vinegar*, as her Appetite serves. She may take often a Decoction made of *Flower of Barley*, first baked a little in an Oven, and then mixed with *Yelks of Eggs*, to make it more Nourishing and easie of Digestion. She may likewise eat after her Meals, a little *Marmelade of Quinces*, or *Jelly of Gooseberries*, and drink some old *Red Wine* mixt with *Spring Water*, or in want of that, clear *River Water with Iron quencht in it*. Let her refrain from all Fat Meats, which are apt to relax the Stomach, and excite Vomiting, and so do all things which are sweet and prepared with Sugar. Let her give a grateful sharpness to whatever she Eats, for all sharp things are Astringent, and preserve the Tone of the Stomach. A Spoonful of *Aqua-vita*, or a Glass of Sack now and then, is very proper to take of *Nausea's* and Vomiting.

If Vomitings continue after a Woman is gone half her Time, have Recourse to Mild Purges, as *Sena*, αi . *Rhubarb*, $\alpha \beta$. and *Syrup of Succory*, αi . This is a good Medicine to attenuate and carry off the Tenacious Humours lodged in the Stomach and Guts; or purge her with *Manna*, *Cassia*, *Tamarinds*, and such like Lenitives, never omitting a little *Rhubarb* and *Compound Syrup of Succory*. But a Woman under these Circumstances, must never use violent Medicines, as *Antimony*, *Hellebore*, or *Scammony*, for fear of an Abortion.

If notwithstanding the Woman continues to Vomit, it is best to leave the Cure to Nature, for fear of an Abortion, which will infallibly follow when she is seized with the Hiccough.

Note, Here it is convenient to Bleed, in these Cases before Purging, interposing some small interval of time between these Evacuations, for fear of putting the Blood into too great a Commotion.

The Cold Air is a great Enemy to Women apt to Vomit, and therefore they ought to go warm Clad, and wear a Lamb's Skin on their Breast and Stomach.

Of Pains in the Back, Reins and Hipps of Big-bellied Women.

The Pains of these parts proceed from the Distention of the Ligaments of the Womb, which are inserted in these Places. The best Remedy to appease these Pains is Rest, and a Big-bellied Woman who in straining has distended these Ligaments, ought to lose a little Blood in the Arm, and keep her Bed for sometime. If the Pains arise from a bearing down of the Womb on the Lower Parts, the Woman must keep her Bed, or at least her Belly must be suspended with a large Swathe till the time of her Delivery.

If there be any extraordinary Excretions from the Womb mixt with Blood during these Pains, there is great danger of Abortion, and it shews the Womb begins to open. But to avoid being deceived in passing a Judgment in this Case, consider well if there be a great Repletion of Blood, or the Woman be subject to the Gravel, both which are capable of producing this Accident; and if either of these appear to be the Cause, let proper Remedies be used, but with great Moderation.

Of Pains in the Breast.

When a Woman becomes Pregnant, her usual Monthly evacuations ceasing, and she breeding still new Blood, it flows to the Breasts, and distending the Vessels there creates great Pain. A Woman at this time must be exceeding careful not to hurt these parts which are extremely Sensible. She must not go with her Bodice strait Laced, for fear of a Contusion, which may end in an Inflammation and Abscess. If the Pains of her Breasts continue after the third Month, let her Bleed in the Arm, forbearing all Repellent and Restraining Medicines, let her use a cooling Diet, moderately Nourishing, and keep her Body Open.

Of Difficulty of Urine.

When the *Fetus* compresses the upper Part of the Bladder, it necessitates a Woman to make Water every Moment; but if it compresses the Neck, as in the first Months after Conception, it intercepts its Passage. Sometimes the sharp Salts of the Urine, pricking the Bladder, stimulate a Woman to make Water frequently, and inflame the Bladder, from whence a Suppression of Urine ensues.

If a Woman with Child have a Stone in the Bladder, it is exceeding troublesome, and the Womb pressing the Bladder on it, creates insupportable Pain, if the Stone be rugged and unequal.

There is a necessity to help this Accident as soon as is possible, because the Woman's straining to make Water, forces down the *Fetus*, and hastens the Birth. If it proceeds from a Compression of the Bladder by the bigness and weight of the Womb, the Woman may in some measure help this by keeping up her Belly with both Hands when she makes Water; or suspending it with a Swathe, or which is best of all keep her Bed. If it proceeds from the Acrimony of the Urine, which inflames the Neck of the Bladder, it must be abated by a cool Regimen, and drinking a Ptilan, refraining from Wine. She may use Emulsions Morning and Night made with the Cold Seeds in Barley Water, with a Spoonful or two of Syrup of Violets, or *Nymphaea*. If this do not abate the Inflammation, let her Bleed in the Arm, and foment all the External part of the Neck of the Bladder with warm Milk, or a Decoction of the emollient cooling Herbs, as *Mallows*, *Marsh-mallows*, *Pellitory*, *Violet Leaves*, with a little Linseed; or inject the same into the Neck of the Bladder, adding to it a little Oil of Violets or warm Milk; the Woman in the mean time must refrain from Copulation.

If these Remedies prove ineffectual, hold up her Belly and introducing a Catheter (being first well Oiled) through the *Urethra* into the Bladder, by this means evacuate it, and if the Suppression return, use the Catheter again, as long as occasion shall Require. If this inconvenience continue, let her use the Half-Bath, having an especial care that

she be not moved by it; all hot Diureticks endanger an Abortion, and therefore she must shun the use of them.

If the Difficulty of Urine proceed from a Stone of the Bladder, thrust it back with the Catheter if it be large, but if it be small, try to fetch it away with an Extracter, putting the Forefinger into the *Vagina* to keep it steady, and hindering it from recoiling into the Bladder.

Of a Cough and Difficulty of Breathing.

Women whose Children lie high are subject to a Cough, because the Womb bears up the Diaphragm. A violent Cough is one of the most dangerous Accidents which can befall a Woman with Child, and must be carefully prevented by a regular and cooling Diet, avoiding all sharp and high Seasoned Meats. If it arise from the sharpness of the *Lympha*, she must refrain from all sower things, as *Oranges*, *Lemmons*, *Pomgranates*, *Vinegar*, *Verjuice*, which are to irritate the Part, and excite a Cough. On the contrary, let her use all such things as temper and sweeten the Blood, *Milk-meats*, Decoction of *Liquorice*, *Sugar-candy*, *Syrup of Violets* and *Mulberries*, some Spoonfuls of which she may mix with her Ptilan (made of *Fujubes*, *Sebesten*, *Raisins of the Sun*, *French Barley*, with a little *Liquorice*,) adding to all these a few Clysters. In the last place, if all these means prove ineffectual, and there appear manifest signs of Repletion, let her Bleed at whatsoever time of her going with Child it be, for moderate Bleeding can never be so dangerous as a continual Cough.

If her Cough proceed from taking Cold, let her keep her self warm in her Chamber, and take some Spoonfuls of Syrup of burnt Wine. To make this, & the best Wine half a Pint, *Cinnamon grossly powder'd*, z.ii . *Cloves*, n. vi . *Sugar double Refined*, z. iv . Put these together in a Silver Porringer, and boil them upon a Chafing-dish to the consistence of a Syrup, of which let the Woman take at Night, an Hour or two after a light Supper, or let her take a little good *Rosa Solis*. It is requisite the Woman have her Body Open, to which end she must sometimes take Clysters, have all her Drink warmed, speak little, and refrain from Copulation. If she

want

want Sleep, that must be procured by Mild Somniferous Juleps, and not by strong Nercoticks, which are dangerous in pregnant Women, and never to be used without pressing Necessity.

Some Women bear their Children so high, that they have not liberty to Breathe, in this case Bleeding is necessary to discharge the Lungs, and make room for their Expansion. If this difficulty of Breathing proceed from a Compression of the Diaphragm, the Woman must go loose in her Dress; must eat but little at a time and often; must refrain from all viscous or windy Meats, as *Pease*, only feeding on things easie of Digestion, and Laxative; must shun all Melancholy Apprehensions, and sadness of Mind; for these Passions are apt to divert the Blood, and determin it to the Heart in so great a Quantity, as may endanger a Suffocation.

Of Varicose Swellings, and Pains in the Thighs and Legs.

In the last Months of a Woman's going with Child, the Womb being very much distended, compresses by its weight the Iliac Veins; by which the Refluent Blood is hindred in its Ascent, and the *Saphena* and Crural Veins, together with all the Vessels of the Legs and Thighs, are tumefied by its Regurgitation, and the Blood it self stagnating, causes great Pains and Swellings. These varicose Swellings only admit of a palliative cure during the time of Pregnancy, viz. by laying a compress of Rags, and binding it on the tumefied Vessels. Let the Roller with which the Part is bound, be about two or three Inches broad, and begin to apply it below, ascending to the *Varices*, which being constringed by this Bondage, are incapable of farther Dilatation, and the Blood hinder'd from staying too long, and corrupting in them, whilst at the same time it finds a passage through the other Vessels, and by consequence the Circulation is not intercepted. Let the Woman during this keep her Bed as long as she can, because the Blood ascends to the Head more easily, whilst she is in this Posture, than when standing. If the *Varices* arise from Repletion, let her Bleed in the Arm. Bleeding in the *Varises* themselves is condemned by Practitioners;

as being an equivalent to Bleeding in the Foot, a thing never to be practised in Women with Child.

Some Women have only Oedematous Swellings (proceeding from abundance of ill Juices) which retain the impression of the Finger. These are to be cured by promoting Transpiration, by applying compresses dipt in Aromatick Tinctures, and repeated twice or thrice a Day; for instance, *Rosemary, Bays, Time, Marjoram, Sage* and *Lavender*, Ana one Handful; *Provence Roses*, half a Handful; *Balaustians Alum*, Ana ʒi. Boil all in three Pints of Red Wine, to the consumption of one third, and then strain it through a Linen Cloth, and keep it for use.

Of the Hemorrhoids.

The *Hemorrhoids* in Women with Child, arise from the stopping of their Courtes, which constrains the Superfluous Blood to seek that way for its Discharge; oftentimes they proceed from great straining in going to Stool, Big-bellied Women being for the most part bound.

If the Piles are small and indolent, care must be taken (whether they be within or without the Body) to prevent their encrease by the use of Medicines, proper to hinder and prevent a Fluxion on the Parts, but if they are large and painful, the Pain must be appeased; for so long as that continues, the Fluxion necessarily increases. And therefore if there be an apparent Repletion, let the Woman Bleed to abate and divert the Plenitude, let her Diet be Regular, Moist and Cooling, let her abstain from all high Seasoned Meats; and refrain from the embraces of her Husband. If the Piles proceed from her being bound, and the Excrements are hardened in the *Rectum*, which frequently happens in Persons who have been a long time without going to Stool, give her a Clyster of Warm Water, or a Decoction of *Mallows, Marsh-mallows, Pellitory, Violet-leaves, Linseed* with Honey and *Nennuphar*, mixing with it a little Oil of sweet Almonds, and *Fresh Butter*, without any sharp Ingredients which will not fail to exasperate them, especially when the Piles are inward. To pass in the Pipe with less trouble in giving the

the Clyster, put the lesser end of a Pullets Gut on it. Let her keep to a cooling Diet, and repose her self on her Bed till the Fluxion cease, and during this time foment the Piles with Warm Milk from the Cow, or Decoctions of *Marsh-mallows*, *Tapsius Barbatus*, and *Linseed*. Oil of Eggs alone, or Oyls of sweet *Almonds*, *Poppies* and *Nenuphar* beat up with the Yelk of an Egg, for a long time together in a Leaden Morter, are admirable to allay the Pain, and if the Inflammation be very great, a little of *Galen's Cerate*, mixed with an equal quantity of *Populeon*, may be put in. If the Piles do not go off, and the Swelling do's not abate after the use of these Remedies, open them with a Lancet if they are hard, or if they are soft apply Leeches, which will serve well enough, and create less Pain.

If the Piles discharge Blood in great quantity, the Life of the Mother and Child are both very much endangered; and therefore to prevent this Mischiefe, foment well the part with a Decoction of *Balaustians*, *Pomgranate Peels*, and *Provence Roses* in *Smiths Water*, adding a little *Alum*; or apply a Cataplasm made of *Bole Armoniack*, *Dragon's Blood*, *Terra Sigillata*, and the *White of an Egg*. Bleeding in the Arm likewise is very proper, to turn the Course of the Blood.

Of a Loosness in Women with Child.

Women with Child are subject to divers sorts of Loosnesses, all which are apt to make them Miscarry, if they be Violent and last for any considerable time; but the worst of this kind is a Dysentery or Bloody Flux, because this is accompanied with vehement and sharp Pains in the Guts, which cause Throes and great Straining to go to Stool, which often brings the Birth before the due term is accomplished.

Timely care must be taken in these Fluxes of the Belly to prevent Abortion; and for this end their Nature must be considered; for instance, in a Lienteries ensuing on continual Vomiting, which frequently happens, the Woman must abstain from all sorts of unusual Food; must eat nothing but what is Nourishing, and easie of Digestion, and that in small quantity too, that the Stomach may more easily concoct it; she must drink a little Red Wine diluted with Water, in

which Iron is first extinguished, instead of her Ptisan which is not proper on this Occasion, unless she have a high Fever (for except it be high, she need not refrain) and in this case she may take some good Cordial or Restorative before and after Meals, as a Spoonful or two of Syrup of burnt Wine, a little *Hippocras* or *Alicant*. She may before Meals eat a little Conserve of *Roses*, or Marmelade of *Quinces*, and wear a Lamb-skin on her Stomach, to preserve and strengthen its Natural Heat, which is necessary for Digestion. She must not take any Purgative Medicine, for these are apt to destroy the Tone of the Stomach, and disable it from performing its Office.

When the Flux is no more than a simple gentle *Diarrhaea* of no long standing, and the Woman is not much incommoded or endangered by it, it is sufficient to moderate it without stopping it all at once; but if this Evacuation continues above four or five Days, the Tenacious Humours lodged in the Guts, must be carried off by some mild Purgative, as an Infusion of *Rhubarb* with Syrup of *Succory*, or an Ounce of *Double Catholicon* with *Rhubarb*.

But if the Looseness continue notwithstanding, and become a Dysentery, and she have constantly bloody Stools, great pains in her Bowels, and a *Tenesmus*, she is in very great danger of Miscarrying. The way to prevent this Mischiefe, is to purge with the Medicines before mentioned, and prevent the breeding of ill Humours in the Bowels by a good Diet. To this end let her eat *Veal* or *Chicken Broth*, with the cooling Herbs boiled in it, with a *Quince* to allay the sharpness of the Humours; let her eat *Rice* boiled in her Broth, or let some New-laid Eggs be beaten in, because these smoothen the inside of the Guts.

A Woman in this Condition may drink *Chalybeate Waters*, with a little *Wine* if she have no Fever, or if she have, she may take a Spoonful of Syrup of *Quinces* or *Pomgranats* in a Glass of Water, and eat a little *Marmelade of Quinces*, or *Conserve of Roses*, or some other Restraining and Corroborating Things, after being well Purged. To abate the violent and sharp Pains in the Belly and *Rectum*, which arise from a discharge of sharp Humours on the Parts, and excite continual Throes endangering an Abortion, give

give a Clyster made of the *Decoction* of a *Calve's* or *Sheep's Head*, adding to it two Ounces of *Oil of Violets*, or of new Milk, with the *Yelks* of two new-laid Eggs beat with it; and give the Patient a little *Laudanum* in the Yolk of an Egg, to cause her to rest quietly. When she has retained these *Anodyne* Clysters as long as she can, next give her detensive ones made of the *Decoction* of *Barley*, *Mallows* and *Marshmallows*, with *Honey of Roses*; and after these astringent ones, (without *Oil* or *Honey*, which are laxative) beginning with the weakest, as *Lettuce* or *Plantane Water*; and after giving stronger, made of a *Decoction* of the *Leaves* and *Roots* of *Plantane*, *Tapsus Barbatus*, *Horse-tail*, *Provence Roses*, and *Pomgranate Peel*, boiled in *Smith's Water*, adding *Terra sigillata*, *Dragon's Blood*, equal Parts, two Drains; and with this foment the Fundament. Before the Use of these Restringents, the Woman must be purged with the Medicines above-mentioned, for fear of endangering the Life of both the Mother and Child, by a Retention of Abundance of vicious Humours.

But since *Dysenterick* Pains frequently proceed from a sharp Humour lodged in the Stomach, and the Effect of Clysters does not extend so high, it is convenient for the Patient to drink half a *Porringer* of new Milk twice or thrice a Day, and this Remedy has often relieved pregnant Women in *Dysenteries*. But the Cow which gives this Milk must not be heated, have a gross full Body, or have lately calved; but ought to be sound, and fed upon a good Pasture well watered.

Of the Menstruous Flux in Women with Child.

Sometimes Women have their Courses for the first four, nay six Months. When a Woman voids Blood downwards, it must carefully be considered whence it proceeds, and in what Manner; whether it be the ordinary Courses, or a real Flooding. If it be the Courses, the Blood comes away at accustomed Times, and flows by Degrees from the Neck of the Womb, and not from its Bottom; as may be discovered, if (trying with a Finger) the internal Orifice be exactly closed, which could not be if the Blood

come from the Bottom of the Womb; to all which add, if it be the Courses, it will be small in Quantity. Sometimes this Evacuation of Blood is not Menstruous, and yet must not be thought a Flooding; for if the Woman be full of Blood, and the Abundance be greater than the *Fœtus* can consume, this Evacuation is so far from being hurtful to the Mother or Child, that if the Womb was not discharged of that superfluous Blood, the *Fœtus* would be suffocated by it. On this Occasion, it is better to bleed moderately, than leave Nature to perform her Work.

If there be no visible Repletion, and the Courses continue after a Woman is with Child, it proceeds from an extreme Fluidity of the Blood, which, persisting during the whole Time of her going with Child, makes her subject to miscarry; or if she escape, her Child will be weak, tender and unhealthy. To prevent these Accidents, let her repose her self in her Bed, refrain from all Meats which may heat the Blood, shun Anger, using a cooling Diet, and feeding upon Meats which breed good Blood and thicken it, such as are good Broths made with Chickens, Necks of Mutton, or Knuckles of Veal, in which may be boiled cooling Pot-herbs, as *Purslane*, *Lettuce*, &c. New-laid Eggs or *Fellics*, with *Rice* and *Barley* boiled in them, are good. She may drink Water in which Iron has been quenched, with a little *Syrup of Quinces*. She must refrain from Copulation, because, by heating the Blood, it excites it to flow more. If all these Means are ineffectual, and the Flux continues, make a Revulsion by Bleeding in the Arm, if the Woman's Strength permit, and apply to the Mother's Belly Compresses dip'd in strong Wine, in which a *Pomgranate*, with its Peel, *Provence Roses*, and a little *Cinnamon*, have been boiled. But the best Way is to correct the Mother's Blood.

Of Flooding.

Floodings proceed from the Bottom of the Womb, with great Pain, and come of a sudden; the Blood runs away in great Quantity without Intermission, except when some Clots seem sometimes to lessen the Flux, or stop it for a Time; but soon after it returns with

with greater Violence, and kills both Mother and Child, unless timely prevented.

When this Flooding happens to a Woman who is young with Child, the Cause most commonly is some Mole or false Conception, which the Womb labours to expel, and in that Effort breaks the Blood-Vessels. In Women who are really with Child, it proceeds from a loosening of the *Placenta*, whose Separation opens the Mouths of the Vessels. This most commonly is occasioned by some Blow, Slip or Hurt; though sometimes it is caused by the Child twisting himself in the Navel-string, and so drawing the *Placenta* very strongly. This Flooding never ceases till the Woman be deliver'd, and is more violent and dangerous in proportion to the Largeness of the *Fœtus*.

Every Evacuation of Blood does not require the Woman to be deliver'd immediately; for sometimes the Loss is very small, and may be stop'd by keeping her quiet in her Bed, bleeding her, and confining her to a good Diet; and the Blood perhaps is only her Courses, or proceeds from some Vessel which opens it self on the Outside of the internal Orifice, and keeps the Womb from being exactly closed. In this Case, it is necessary to try whether the internal Orifice is open on the Inside, or whether the Child can be felt across the Membranes; for if so, it is a demonstrative Proof it is a real Flooding, and the Woman will soon miscarry.

If the Blood come away in small Quantity, and the Evacuation do not last long, leave the delivering the Woman to Nature, provided she have a competent Degree of Strength, and no dangerous Accidents happen. But if it come away in great Abundance, or the Woman have Swoonings or Convulsions, it is absolutely necessary to deliver her at whatever Time it be, whether she have the Pains of Labour or not, and there is no other Way to preserve the Life of the Mother and Child. To this End, let the Artist place the Patient on her Back, and anointing his Hand with fresh Butter or Oil, by degrees insinuate his Fingers close together into the Womb, and spread them one from the other when they are in the Entry, and dilate it by degrees without Violence. When he has his Hand in the Womb, if he finds the Waters are not broke, let him tear

the Membranes, and slip his Hand in and fetch away the Child by the Feet, and after that bring away the After-burthen, which does not adhere very firmly, taking care to leave no Clods of Blood behind; for these will cause the Flooding to continue, which otherwise would soon cease.

Since in all great Losses of Blood, great Weakness must necessarily follow, let the Patient be strengthen'd with good Broths, Jellies, or a little Wine; for liquid Aliments have a more prompt Effect than Solids. Let her smell to some spirituous Liquors, as *Aqua Vita*, *Queen of Hungary's Water*; or lay a *Toast steep'd in Wine*, in which Cinnamon has been infused; or bleed her in the Arm, if her Strength permit, and she be not too much exhausted; observing to close the Orifice from Time to Time, for the more easy diverting the Current of the Blood, without weakening her too much.

You may try to stop the Flux of Blood by Napkins dip'd in *Oxyerate* made with *Plantane Water*, applied to the Small of the Back: Or let the Patient lie on a Mat, and take two or three Ounces of *Juice of Purslane*. If all these Remedies are ineffectual, deliver the Woman forthwith, though she be not above three Months gone, leaving nothing in the Womb; and this is the only Means to save her Life.

Of the Weight or Bearing down of the Womb.

The Weight and Bearing down of the Womb hinders a big-bellied Woman in her walking, and causes a Stupor of the Hips and Thighs, Pains in the Groin, a Difficulty of making Water, and discharging the Excrements in the Guts, (because it compresses the Bladder and *Rectum*, and draws down the Ligaments) all which Accidents are capable of making a Woman miscarry. The best Remedy in this Case is to keep her lying a-bed; but if she be not in a Condition to do this, let her support her Belly with a large Swathe, to ease the Ligaments, which are very much strained; and when she makes Water, let her hold up her Belly with both Hands, to keep it from pressing on the *Sphincter*.

If the Neck of the Womb be too much relaxed by the Humidities, let her purge at

convenient Times, and use a dry Diet, feeding much on Roasted Meats. Let her not go strait-laced, for fear of compressing the Womb which bears down too much already.

Of a Dropsie of the Womb.

The Womb is sometimes swoln and distended with Water, which is apt to impose on Midwives, who mistake this Distemper for a Womans being with Child.

Sometimes these Waters are inclos'd in a Cover, and sometimes they are in the Cavity of the Womb. When they have no Cover, they are often mistaken for a true Big-belly, and this Errour remains till the usual Term is completed. The longer any Woman retains these Waters, the more she runs a risque of her Life, and sometimes they grow to so vast a Bulk, that some have been found with 30 lb in their Womb.

To distinguish between this Hydropical Swelling, and a true Great Belly, consider well the Signs of Pregnancy which are delivered above, that having nothing common with this, except a Distention of the Belly, and a Suppression of the Courtes. In a Dropsie the Woman has her Breasts flaggy, soft and fallen, has no Milk in them, do's not feel the Child stir, perceiving only a Fluctuation of the Water, has a great Pain and Weight in the Belly, which is more extended in its Circumference, and do's not rise to a Point, and the colour of her Face is worse, than when with Child. Barren Women are more subject to this Indisposition, than those who have had Children; and these have the Inner Orifice of the Womb, straiter and thinner than the other.

Dropsies of the Womb sometimes happen in Women who are with Child, and in these cases the Waters are without the Membranes which contain the Child. Sometimes too they are inclosed within the Membranes, and the Woman seems to be big with two or three Children, though she really have but one, and that very weak too. Sometimes abundance of these Waters come away two or three Months before Labour, and in this case it is certain they are without the Membranes, for if the Waters were broke, the Child of necessity must needs follow.

When this Dropsie happens to a Pregnant Woman, all the Relief she can have is the Patient expecting her time of Labour, and in the mean time using a drying Diet. But if there be nothing besides Waters contained in the Womb, let her use a Half-bath, Diuretick Medicines, and all such things as provoke the Courtes, to evacuate them. Farther, let her Bleed in the Foot, and purge with strong Hydragogues. The *Bourbon* Waters are very good, especially if she Bathe at the same time she drinks them.

Of Oedematous Swellings in the Lips of the Privities.

Sometimes the Lips of the Privities are so much Swoln, that Women cannot bring their Thighs together, or walk without a great deal of Pain. The Lips are Transparent as in a *Hydrocele*, which arises from the Waters which distend them. It is necessary to discuss this Tumour before the time of a Womans Labour, because it straitens the Passage, and hinders her Delivery. To this end give her a Ptisan made of Roots of *Dog-grass* and *Wild Succory*, in three Pints of which dissolve a Dram of *Chrystal Mineral*, or a little *Spirit of Salt* Dulcified; or make some slight Scarifications on the Lips to discharge the Waters. Apply to these Scarifications a little *Ointment of Roses*, and Compresses steeped in some Aromatick Wine to strengthen the Parts, confining the Woman to such a Diet, as may hinder the breeding of more Waters. Scarification with a Lancet, is much better than the Application of Leeches, because the Aperture made by these little Animals is so small, that it closes immediately, and Scarifications may be kept open as long as you think fit, by laying on unctuous Medicines.

These Oedematous Tumours are not very Dangerous, when they are without Fever; but when they proceed from an Inflammation attended with a Fever, the Womb is most commonly affected too, and it proves fatal to the Person.

Sometimes there are varicose Swellings on the Lips of the Womb, which causes a troublesome Itching. Women who labour under this Inconvenience, are Sanguine for the most Part, and have their Body Bound. To re-

medy this, let them bleed in the Arm, keep their Body Open, refrain from Copulation, and use a cooling Diet.

Of the Veneral Diseases in Women with Child.

If a Woman with Child labour under the Veneral Distemper, and be in her last Months, she must wait till her Delivery before she attempt a Cure, for fear of dying if she happen to be in a course of Physick at the time of her Labour. If the Distemper be not far gone, which is to be known by the Accidents, a Palliative Cure must be attempted for the present, using a regular Diet, and gentle Purging. But if a Woman be in the first Months of her going with Child, and the Pox be very High, and attended with such Accidents as threaten her with Death, if her Cure be deferred for too long a Time, let a slight Salivation be raised by Inunction of the upper parts only, as the Hands and Arms; but observe here, you must never in this case give any Mercurial Preparations by the Mouth, and use the utmost care lest the Frictions throw the Patient into a Looseness, this by disordering the Womb, and exciting Throes, cause an Abortion. Bathing, which is sometimes used as a preparative to Mercurial Inunction, must be omitted in this case, but she may use Ptisans to humect and prepare her for a Salivation, by which (if it be prudently managed) she may be very well cured, and notwithstanding retain her Child till its due Time.

Of Abortions.

If a Woman be delivered before her Seventh Month, it is called an Abortion, but if at any time after the beginning of that, to the beginning of the Tenth Month it is called a Birth, because at that time the Child can live, and never before it.

All acute Distempers cause an Abortion, because they kill the Child, and then it can remain no longer in the Womb. Intermitting Fevers sometimes make a Woman Miscarry, by causing a great Pain in the Belly, and disordering the Child, which commonly struggles very much in the time of the Fit. There are several Accidents which endanger

an Abortion, such as are great Vomitings, which by the straining of the Parts, compress the Womb, and force it to disburthen it self. Nephritick Pains, Cholick and Gripping of the Guts, Stranguries when the Woman labours much in making Water, great Looseness with a *Tenesmus*, abundance of the Courses from the opening of the Womb, excessive Bleeding, Flooding from a loosening of the *Placenta*, Dropsie of the Womb; in short, whatever makes a great Agitation or Concussion of the Woman's Body, as hard Labour, Falls, Leaping, Dancing, Riding, Walking, loud Crying, Excessive Laughing, Blows over the Belly, sudden and surprising Noise upon firing a Cannon, or a clap of Thunder, especially in the younger sort, long Watching, which impairs the Strength, long Abstinence which weakens both Mother and Child, Stinks and ill Smells, as a Lamp of Oil extinguished, or the fume of Charcoal, the Closeness of the Womb, or its smallness, which being compress'd by the *Omentum*, wants room to dilate it self, for the Reception of the Child, Compression of the Womb by strait lacing the Body, to appear well Shaped, or conceal a big Belly; frequent Copulation, especially in the last Months, which opens the Womb. Fleumatick Women, subject to the Whites; are apt to Miscarry, because the Womb is Moist and Lax, and the *Placenta* easily separates. The great abundance of Blood which is carried to the *Fetus* too plentifully sometimes suffocates it. Vehement Rage which puts the Spirits into a great Hurry and Disorder, sudden Fear, or the Relation of bad News, often cause a Woman to Miscarry on the Spot. When Children are Monstrous, they never come at their due Time. The ill Posture of the Child in the Womb sometimes puts him on Struggling, which loosens the *Placenta*, and opens the Womb. In the last place, Children are sometimes so large, that the Womb is not capacious enough to contain them, or the Mother able to give 'em Nourishment.

If after any of these Accidents, a Woman have violent Pains in her Belly and Reins, clods of Blood come away from the Womb, and the Waters are broke, it is certain an Abortion is near. If the Woman feel a great weight in her Belly, and the Child fall as a Ball

Ball on which side soever she lie, and stinking Humours come from the Womb, she will Miscary of a dead Child; especially if the Breasts, which before were hard and full, Fall and Decay. We have above directed how to prevent these kinds of Abortions, and therefore shall remit the Reader thither.

A Woman who is subject to Miscarry ought to keep her Bed, use a good Diet, and refrain from Copulation; so soon as she perceives her self with Child, avoiding all Diureticks and Aperitives, and all Passions of Mind, go loose in her Dress, wear low-heel'd Shoes, and take care not to Stumble. When a Woman with Child happens to receive any Hurt, let her keep her Bed, have Compresses steeped in some Astringent Wine, applyed to her Belly, and let her be immediately bled in the Arm, without deferring it as usually.

Observe here, that a Woman must never be Delivered, whilst she has a continual Fever on her, for in this case she will die immediately after her Delivery. It is a mistake to think her Cleansings will remove that, on the contrary it encreases them, and the Cleansings are entirely suppress'd. And therefore all endeavours must be used to abate the Fever before the Womans Delivery.

How to order a Woman when her Reckoning is up.

When a Womans term is up, she must abstain from all violent Exercises, lest they cause a Flooding, occasion the Child to take a wrong Posture, or hasten the Birth some days before its Time, all which is very prejudicial to the Woman: On the contrary, let her walk moderately, repose her self more near the end of her Time, than in the beginning of her Pregnancy, and let her go loose in her Dress. Let her observe a Regular Diet, using Meats which yield good Juices, and are easy of Digestion, rather roasted than boiled, to humect more, and keep her Body Open, that so she may not be obliged to take Clysters, which are apt to hasten the Birth. From the eight or ten last Days, let her anoint the bearing Parts with Oyl of sweet Almonds, and Greases to relax and soft-

en them, and open the Passage, especially if it be the first Child, because the parts are straiter: Women who are in Years, and never had Children, must have a great care to relax the Parts well with Greases, because they are Dry, and do not yield so easily, besides the Articulation of the *Coccyx* or Rump-bone is very firm, and do's not easily give way in Labour.

Women when they are near their Time, may not bleed by way of Prevention, unless they are subject to Flooding, nor in the seventh Month; because this creates a Disorder in the Body, and puts them in danger of Miscarrying.

Women near their Time, ought to be provided with some able Midwife or Artist, whom they must send to as soon as they find any great Pains in their Belly, for some times the least Cholick Pain or Gripe flings them into Labour.

How a Woman is to be ordered after her Delivery.

When a Woman is compleatly Delivered, and the Burthen brought away, a closure of fine Linen Rags five or six times doubled, must be applied to her Privities, to prevent the cold Air from entring her Body, which would shut the Vessels, and stop the Cleansings, and cause vehement Pain and Gripping of the Guts, with an Inflammation of the Womb, a Fever, Pleurisie, and frequently Death it self.

After the entry of the Womb is clos'd, let the Woman who is newly Delivered, be carryed to a Bed, provided for the Purpose, and covered with Cloths to receive the Cleansings. But if she be Delivered in her own Bed, which is best, to avoid the trouble of carrying her to another; let the Cloths and other things be removed, which were laid to receive the Waters and Filth in Labour, and let her be placed in a convenient Situation, that so she may take her Rest, and recover the Strenght she has lost in Labour. Let her Body be raised for her more easy Breathing, and the flowing of her Cleansings, which if they are retained cause great Pains. Let her put down her Thighs and Legs close to each other, and have a Pillow under her Hams to support them; lastly,

let her lie on the middle of her Back without turning either to one side or another, that so the Womb may resume its Natural Situation.

As soon as the Woman is Delivered, give her an Ounce of Oil of *sweet Almonds drawn without Fire*, with an equal quantity of *Syrup of Maiden-Hair* to cool her Throat, which is heated with her Cries in Labour, and take off her Gripes. However, if the Woman nauseate this Remedy, forbear it, and give her some good Broth as soon as she is a little recovered from the Fatigue of her Labour, and leave her to Sleep, suffering no noise to be in the Chamber, drawing the Curtains, shutting the Windows and Doors, not imitating the Practice of some who forbid a Woman to sleep after her Labour; good Repose being the most proper means to recover Strength, and abate all Accidents which happen.

Of Applications to the Belly and Breasts of a Woman newly Delivered.

As soon as the Womans Bed is fitted, apply to her Privities an Anodyne Cataplasim made of two Ounces of Oil of *sweet Almonds*, and two *New-laid Eggs*, both Whites and Yelks stirred together, over warm Embers, to the consistence of a Cataplasim, and spread on a Rag, and laid on moderately warm. This Cataplasim is very good to abate the Inflammation of the Parts after hard Labour; when it has lain on three or four Hours, renew it if the Inflammation shall require it; Lastly, make a Decoction of *Barley*, *Linseed*, *Chervil*, *Agrimony*, *Marsh-mallows*, and *Violet Leaves*, and wash the Lips of the Part two or three times a Day, to clear it from Blood and other Filth, proceeding from the Cleanings; and to appease the Pain, foment it with *Warm Milk*, *Barley* and *Chervil Waters*.

Astringents are not proper till fifteen days after Delivery, when the Purgations are come away, and then such as strengthen the Parts may be used; as a Decoction of the *Roots and Leaves of Plantain* and *Provence Roses*, in *Smith's Water*. After the Cleanings are entirely over, which is about the space of three Weeks, to corroborate and close the Parts, *Water of Myrrh*, or an Astringent Lotion

may be injected, *v. g. R. Pomgranate Peel, 4 p. Cypress Nuts ʒiβ. Acorns ʒi. Terra Sigillata ʒβ. Provence Roses ʒi. Roch Alum ʒij.* Infuse all for the space of a Night in half a Pint of strong Red Wine alone, or diluted with *Smith's Water* if it be thought too Sharp; or boil it till it be reduced to a Pint; strain it through a Linen Cloth, and press it, and with this foment the Part well Morning and Night.

As soon as a Woman is Delivered, let the Skins of some Animal be laid on her Belly to keep it Warm. If her Labour has been very Hard, let her be very gently Swathed; because her Belly is very Sore; nor must these be straitned till her Cleanings are all over. Some Midwives and Nurse-keepers lay a Compress doubled on the Belly, and another large square one over that, and keep these on with a Napkin in three or four Folds, of a quarter of an Ell Broad, and so straiten and compress the Belly, but these do only bruise and hurt it. It is better to lay a great square Compress for the first fifteen Days, to keep it in its right Position, undoing this Bandage several times a Day to anoint the Belly (if it be Sore, and she be Griped) with Oil of *sweet Almonds*, which is better than all the *Pomatus* in the World. When that time is over, you must straiten the Belly and bring the Parts together, in which you have nothing to fear, because the Cleanings being Finished, the Womb is diminished in its Bulk, and there is no great danger of hurting it, provided it be moderately Strait, for if it be too strait the Womb is thrust down, and the Woman suffers great inconvenience by that Means, and the Flux causes her Belly to remain big for a long time after.

If the Woman intends to suckle her Child, let her Breasts be covered with fine soft Cloths, to prevent the Milk from curdling in them. If the Milk flow in great abundance to the Breast, embrocate them with a mixture of Oil and Vinegar, and apply Rags dip'd in it to them.

What Diet a Woman ought to observe during the time of her lying In.

A Woman newly Delivered, must observe the same Diet as Persons in a Fever to pre-

prevent it. She must be very Regular and Abstemious the three or four first Days, taking only some Veal or Chicken-broth, New-laid Eggs, or some good Gelly, refraining from all solid Meats.

When the abundance of Milk is over, she may be permitted to eat a little Broth at Dinner, or a little boil'd or roasted Chicken, by degrees encreasing the quantity of her Meat, which always must be easy of Digestion; let her ordinary Drink be a Ptilian made with *Dog-grass*, *Barley* and *Liquorice*, or *boil'd Water*, which she must not drink Cold; she may drink a little White-wine diluted with Water, after the first five or six Days.

Women us'd to hard Labour, require more plentiful Nourishment than others, and it is sufficient for these to lessen the quantity of their ordinary Food.

Let the Woman keep her Bed and rest her self well, not disturbing her Mind with the Concerns of her Family, and avoid all Talking, let her Body be kept open with Clysters, giving her at least one Ounce in two Days, and let her be careful to order her self in this Manner, till her Cleansings are over. In the last place to finish all, and purge off the remaining Impurities, let her take *Cassia* with the *purgative Syrup*, and bath and cleanse her Body to receive the Embraces of her Husband.

How to dry up the Milk.

If a Woman do's not intend to suckle her Child, apply to her Breasts a Mixture of *Oil and Vinegar*, or *Ointment of Populeum*, and *Galen's Cerate*, all spread on Rags or Brown Paper, or a Rag dip'd in *Warm Verjuice*, with a little *Alum* dissolved in it to make it more Astringent, or the *Lees of Wine*, either by it self or mixed with *Oil*. All these are Repellents, and hinder the Humours which breed Milk from flowing too plentifully to the Breast.

To discuss and dissipate the Milk which is already gathered in the Breasts, apply a Cataplasim made of the four Meals, (viz. *Barley*, *Fennigreek*, *Linseed* and *Fitches*.) *Honey* and *Saffron* boiled with a Decoction of *Chervil* and *Sage*, or make a Cataplasim of *Honey* alone, or rub the Breasts with it, and

lay on them Leaves of *Red Cabbage*, having first cut off the great Ribs, and deadned them before the Fire. Or make a Decoction of *Box-leaves* and *Sage* in Urine, and foment the Breasts with this, and let Rags dip'd in it be applied to them. In the Application of these Remedies, great care must be taken that the Woman do not take Cold, as likewise of inflaming the Breast for fear of an Apostem; wherefore Remedies must be changed as Symptoms alter. One good way to prevent the breeding of Milk in the Breast, is Purgings, and keeping the Body Soluble with Clysters. Much stirring of the Arms is apt to create a Pain in the Breast, and therefore the Woman must use them as little as possible.

About three Weeks after a Womans Delivery, when the Milk is entirely gone off, Astringent Medicines may be used to strengthen the Breasts. To this end apply to the Breasts Cloths dip'd in *Myrrh Water*, or anoint them with *Oil of Wallnuts*, being careful not to cause hard and painful Swellings by the use of Astringent Medicines.

Of Flooding in Women newly Delivered.

When the Burthen is great the Vessels most commonly are very large, and if it be brought away with Violence, a great Flooding follows. This Flux of Blood happens likewise, when any Part of the Burthen remains behind in the Womb, or there is any false Conception in it; for Nature striving with its utmost Efforts to expel any Extraneous Body, breaks the Vessels, and pours a Torrent of Blood out of them: Sometimes Serosities only flow from the Womb, and the Standers by are inclined to believe the Flooding is stop'd, when indeed the Mouths of the Vessels are only block'd up by clods of Blood; after the removing which, the Flooding Returns, and is often more vehement than before.

Flooding is the most dangerous of all the Accidents which befall Child-bearing Women, and the Blood sometimes comes away in such large Quantities, that there is no time to remedy it, and the Woman dies upon the Spot. If it proceed from some Portion of the Burthen retain'd in the Womb, or Clods of Blood, or some false Conception.

tion, all endeavours must be used instantly to bring away those Extraneous Bodies; but if after they are removed, the Blood do's notwithstanding continue to Flow, Bleed the Woman in the Arm if she have strength to support it, and whilst she Bleeds stop the Orifice from time to time, and let her lie along (that is with her Head not too High) and keep her self Still, that by this means the Blood may flow in less proportion to the Lower Parts, and a sufficient Diversion be made without too much weakning the Patient. Her Belly must not be straitned with any Swathe or Compress, for all Bandages are Hurtful, if the Belly be Sore. Instead of this, let the Air of her Chamber be kept Cool, and cover her lightly for fear of heating the Blood, and putting it into a Ferment, (and so encreasing the Flux) and give her some strong Clyster.

If in spite of all these Remedies the Flooding do's not cease, lay her upon fresh Straw with a single Cloth on it, and apply to her Loins Napkins dip'd in cold *Oxyerate*, or if it be Winter, a little warm'd. Let her take a little Juice of *Purslain* alone, or mix'd with her Broths, or make Injections of *Plantain Water*. Some pretend that a Girdle of *Knotgrass* put about the Waist, stops all Fluxes of Blood.

Every half Hour to recruit her Strength, she may take a little strong Broth, or some Spoonfuls of Gelly, or Yelks of New-laid Eggs at convenient distances of time, not eating too much at a time, for fear of overcharging her Stomach. Let her Drink be *Red Wine* diluted with a little Water, in which Iron has been Extinguished, and let Cloths be dip'd in Aromatick Tinctures, or in defect of these in Burnt Wine, be applied to the Region of the Heart.

When the Flux of Blood begins to stop, and the Woman is a little recovered from her Weakness, let her use a Ptisan made of *Burnet* and *Barley* for her ordinary Drink. If these Remedies have not their due Effect, the Patients Life is in great Hazard, and if she escape, you must expect in a few days a violent Pain in the Head, with a continual Fever, attended with cold and hot Fits, and this sometimes is intermitting. Women who recover after violent Floodings, have their Legs ordinarily Swoln for some Months

after, because the New Blood must of necessity be Serous, and cannot recover its due Consistence in a considerable Time. The first Courfes which come after Flooding are very Plentiful, and in greater quantity than usual, which makes the Woman fear the Flooding is returned; but this proceeds only from the largeness of the Blood-Vessels, is not Dangerous, and requires no other Remedy than Rest, and refraining from Copulation.

Of the falling out of the Womb after Delivery.

When there is a falling out of the Womb, the Woman feels a great weight at the bottom of her Belly, great difficulty in making Water, a Pain in her Reins and Back, and a Reddish Water comes away from the Neck of the Womb, which is relaxed and hangs out.

To Remedy this Indisposition, let the Neck of the Womb be forthwith reduced to its Natural Place, and if the Woman be young, and the Disease be recent, she may be Cured, but if it be of long standing, the Cure will be difficult to perform. If the Womb come quite forth upon a Woman's Delivery, and be not immediately Reduced, her Life is in very great Danger. When this happens, the Artist must have a care not to mistake that large Portion of Flesh which hangs between the Thighs for some Extraneous Body, it being the Neck of the Womb it self, which has lost its Rugosities by its Relaxation. If he draws this, there is great Danger of causing a Flooding, and killing the Patient.

For the curing of this Disease, it is necessary to reduce the Womb to its Natural Place, and retain it there. To do this, let the Woman make Water, having first to facilitate the Work given her Clysters to evacuate the gross Excrements in the *Rectum*, then let her lie on her Back with her Hips raised higher than her Head, and foment with *Milk or Wine* Luke-warm, that which hangs out between her Thighs, and take the Neck of the Womb with a soft Rag, and reduce it to its Natural Place, thrusting it with the Hand sometimes on one Side, sometimes on the other. If the Neck of the Womb be so large that it cannot Enter, anoint it with

Oil of Sweet Almonds, to put it up the more easily; and when it is reduced, wipe off the Oil for fear it relax the Part, and occasion its falling out again. If the Womb cannot be Reduced, there is great danger of its gangrening, and killing the Woman.

When the Womb is replaced, let the Woman be laid on her Back, with her Hips a little raised, and her Legs crossed, and her Thighs close to each other, for fear of its falling out again, and put a Pessary into the Neck of the Womb to keep it there. These Pessaries are made of a thick piece of Cork, covered with White Wax to preserve them from Rotting, and keep them from hurting the Neck of the Womb, and may be drawn out from time to time to cleanse them; the Reader will find the Figure of them in the Plates annexed at the end.

Whilst the Cleansings continue, there is no other Way to strengthen the Womb, and keep it in its proper Place, but by Pessaries; for astringent Medicines suppress those Purgations, and are of dangerous Consequence; and compressing the Belly by swathing it forces the Womb still down. Let the Patient have the Pan given her in Bed, and in voiding her Excrements, let her lay her Hand before to keep the Womb from falling out. When the Cleansings are over, astringent Injections may be used, and the Pessary covered with Medicines of the like Nature, and the Woman be purged if Occasion requires. If she be newly delivered, she must not rise from her Bed in six or seven Weeks, during which Time she must refrain from the Embraces of her Husband.

Of the falling out of the Fundament.

When the vehement Straining of a Woman in her Labour has occasioned the falling out of the Fundament, if the Child be advanced in the Passage, advise her not to help her Throes so much, and defer the Reduction till after the Birth, because it cannot be done before without bruising the Gut. But so soon as she is delivered, reduce it in the same Manner, and observing the same Cautions, as in the falling out of the Womb: But omit on this Occasion giving of Clysters, because they are apt to excite a

Straining to go to Stool, and endanger a Relapse.

Of the Hemorrhoids.

Women are commonly troubled with the Piles during their lying in. To prevent this Inconvenience, let them sit with their Fundament in a Basin full of warm Water for a Quarter of an Hour at a Time; or foment the Piles with warm Milk for the first Days, or Oil of Eggs beat in a leaden Mortar, either alone or mixed with Oil of Populeon, being careful to put in no Ingredients which may irritate them. By procuring a good Evacuation of the Lochia from the Womb, this Pain abates of consequence.

Leaches applied to the Piles in any of the first Days are apt to divert the due Evacuation of the Cleansings, and bring a Fluxion on the Piles; and for this Reason (if used) must be deferred till eight Days or more after Delivery.

Of Contusions and Rents in the external Parts of the Privities.

The great Dilatation of the Privities, which is made by the Child in making its way out, cannot fail of sometimes making Contusions and Lacerations; and if these Accidents are neglected, they degenerate into malignant Ulcers, by reason of the continual Heat and Filth of that Part. If there be only simple Contusions or Excoriations, there is nothing farther necessary than the applying a Cataplasim made of the Yelks and Whites of new-laid Eggs, with Oil of sweet Almonds, seethed over warm Embers, and stirred till they unite. Let this Cataplasim be spread on fine Stupes or Rags, and applied warm, leaving it on for the Space of five or six Hours. Next lay Rags dip'd in Oil of St. John's-wort on the excoriated Lips, renewing them twice or thrice a day, bathing the Parts each time with Barley Water and Honey of Roses, &c. to cleanse them from the Excrements which come from the Womb. When the Patient makes water, cover the Lips of the Privities with fine Rags, to prevent them from being excoriated by the Sharpness of the Urine. If these Excoriations are painful, the best

Re-

Remedy is Oil of Walnuts drawn without Fire.

Sometimes Midwives do so much Violence to the bearing Part, that it is very much inflamed, and a great Abscess formed in it. When this happens, it is necessary to give vent to the Matter, and after that is discharged, to inject some vulnerary Decoction made of *Barley Water* and *Honey* into the Cavity, with a little *Honey of Roses* and *Spirit of Wine*, and so treat it in the same Manner as all ordinary Ulcers.

Sometimes the *Perinaeum* happens to be rent quite down to the Fundament in the Birth, so that the *Anus* and Privities make but one common Hole. If this were left in this State, the Woman would be delivered with more Ease of her next Child; but notwithstanding it is better to reunite the Parts as soon as may be; because the Excrements coming that Way disgust the Husband, and the Woman is by no means fit to receive his Careless.

Wherefore having cleansed the Part with *Red Wine* lukewarm, let the Rent be stitch'd with three or four separate Stitches, according to the Length of the Laceration, and take at each Stitch good hold of the Flesh; and then dress it with some agglutinating Balsam, as *Arcaus's Liniment*, covering the Wound with Pledgets or Linen Cloths, to prevent the Excrements from falling on it, which would cause a great deal of Pain, and hinder its Coalition; and let the Woman keep her Thighs close till the Cure be perfected.

If the afterwards happen to be with Child, let her take care not to anoint those Parts with Greases and emollient Oils for some time before her Labour, that so the Parts giving way in the Birth, may not be torn. A Woman who has once had an Accident of this Kind, ought to employ a skilful and dextrous Artist; because in all Labours after, there is very great Danger of Laceration, the Passage being very much straiten'd by the *Cicatrix*.

If the Reunion of the Wound be neglected at first, the Callosity on the Edges must be cut off with a Pair of Scissars, and it must then be stitched, as is above directed

If the Child stop too long in the Passage, there is a Retention of Urine, which creates an Inflammation and Ulcer in the Bladder, which in time becomes a *Fistula*, and emits the Urine involuntarily. This *Fistula*, when there is a Loss of Substance, and great Part of the Neck of the Bladder is consumed by the Suppuration, is incurable; otherwise it may be healed by due Care and Diligence.

Of Pains happening to Women after Delivery.

After a Woman is delivered, she ordinarily is troubled with sharp Pains in the Reins, Back, Groins, and sometimes in the Womb, and all over the Belly. These Pains are sometimes continual, and sometimes intermitting, and proceed from Wind in the Guts, or some extraneous Body remaining in the Womb after Delivery, which Nature strives to expel with her utmost Efforts. Some false Conception, some Portion of Burthen, or some Clods of Blood in the Womb, may be the Cause of these After-pains, which cease not till they are ejected, and are not (like the Wind-Colick) alleviated by giving of Clysters, but rather exasperated.

Sometimes these Pains proceed from a sudden Suppression of the Cleanings, and then the Womb is distended and inflamed, the Belly is hard and swollen, and the Woman is quickly killed by it.

Sometimes these Pains arise from an excessive Distention of the Ligaments of the Womb, and then they are fixed in the Back, Reins and Groins, the Places where these Ligaments are inserted; and sometimes they reach to the Womb it self, especially when it has suffered much Contusion in Labour.

To prevent these Pains arising from Wind, let the Woman take a Mixture of *Oil of sweet Almonds*, with *Syrup of Maiden Hair*. *Oil of Walnuts* is better, if the Taste be not too nauseous. These Medicines, by their Unctuousity, make way for the Contents of the Guts to slip more easily through them. If the Woman have an Aversion to any thing of this Nature, give her some very hot Broth, or half a Glass of *Hippocras*, provided there be no Danger of a Fever. She must keep her Belly warm, must not drink her Pilsan cold, and

and must lay warm Cloths on her Belly, if her Pains be very troublefome to her, anointing it with *Oil of sweet Almonds*, or applying a *Pancake of Eggs* fry'd with *Oil of Walnuts*, taking care not to fwathe it too ftrait. The next Morning give her Clyfters made of a Decoction of the emollient Herbs, with a little *Linfeed* boiled in it, adding *Honey of Roses* and *Oil of sweet Almonds*, of each three Ounces, or a little *fresh Butter*, repeating thefe Clyfters as oft as Occafion requires. Some Women, as foon as they are delivered, drink the Broth of an old Partridge boiled with Leeks: Others take a Draught of Milk boiled, to which they put five or fix *Walnuts* pounded with a little *Sugar*, and fo ftrain all hot through a Linen Cloth. But thefe Remedies are insignificant, if the Pains arife from any extraneous Bodies retained in the Womb; for thefe muft neceffarily be expelled, and when that is effected, the Pains will ceafe of their own accord, except the Blood happen to leave any Clods; and if fo, thefe will not fail to produce as fharpe Pains as thofe after Labour.

If the Cleanfings which were copious before, happen to be ftop'd on a fudden, vehement and fharpe Pains will follow, and care muft be taken to procure an Evacuation of them by Clyfters, Hot and Aperitive Fomentations applied to the Privities, and Bleeding in the Foot.

As for the Pains in the Back and Groins, which proceed from the great Extension of the Ligaments, they are to be removed by Reft, and a Regular way of Living.

Of the Cleanfings, and the Signs when they are Good or Bad.

Thofe Cleanfings are good which are bloody the firft Days, and after lofe that Colour, and by degrees become White. Their Confiftence ought to be uniform without any Concretions or Clods, farther they ought to be void of all Acrimony and ill Scent, and come away in a moderate Quantity.

They muft not continue bloody longer than the firft Days, otherwife inftead of Cleanfings, there would be a dangerous Hæmorrhage. When they gradually lofe their Red Colour, and grow White, it is a fign the Veffels be-

gin to Clofe, and when their Confiftence is equal without any Clods or concreted Matter, it is certain there is no mixture of any Heterogeneous Subftance with them; when they have no ill Scent or Acrimony, it is evident there is no Inflammation or Corruption of the Womb; In the laft place when they flow Moderately, the Superfluities only are Difcharged, but when they flow in great Quantity, the Woman is exceedingly Weakned, feized with Convulfions, Swooning Fits, extreemly Emaciated, and continues Pale for a long Time, and her Thighs and Legs Swell, and become Hydropick.

Of the Suppreffion of the Cleanfings, and the Accidents which follow thereupon.

When the Cleanfings are fuppreff'd, the Humours corrupt by their long ftay in the Womb, or caufe fome Inflammation. If the Cleanfings happen to be fuppreff'd in the firft Day, there enfues an acute Fever, a vehement Pain in the Head, Pains in the Breaft, Reins and Back, a Suffocation and an Inflammation, which extends all over the Lower Belly, and this becomes diftended. Befides this, the Woman finds a great difficulty of Breathing, ftoppage at Stomach, palpitation of Heart, *Syncope*s, Convulfions and *Delirium*, and thefe Symptoms frequently prove Mortal to her. If the Suppreffion continues, there is great danger of an Abfcels in the Womb, or perhaps of a *Cancer* or Apoftumes in the Lower Belly, Sciatica's, Lameneis or Inflammations, and Abfcelses of the Breasts, according as the Humours take their Courfes, and thefe Suppreffions are more dangerous by much, than thofe of the Courfes.

A Loofenefs fometimes is the caufe of the Suppreffion of the Cleanfings, and fometimes it proceeds from a diforder of the Spirits caufed by a violent Fear, Sadnefs, or Dejection of Mind, Anxiety, or any difmal Apprehenfion. Great Cold conftinges the Veffels, and coagulates the Blood in the Womb, Cold Drink, and Reftriquent Meats have the fame Effect, and very much ftirring diffufes the Humours through the whole Body, and hinder their difcharge by the Womb.

To bring the *Lochia* well down, let the Woman avoid all perturbations of Mind; let her lie in her Bed with her Head and Breast a little raised, (keeping her self very quiet, that so the Humours may be more easily carried downwards) let her observe a good Diet, something Hot and Moist; let her rather use boil'd Meats than Roasted, and if she be any thing Feverish, drink Broths only with a little Jelly, avoiding all binding Things, and let her Ptisan be made with Aperitives, such as Roots of *Succory*, *Dog-grass*, and *Asparagus*, with a little *Anise-seed* and *Hops*, and every other time let her take a little Syrup of *Maiden-Hair* in a Glass of the Ptisan, and carefully shun Cold Drink. Let Clysters be given her, and her Lower Parts fomented with an Emollient and Aperitive Decoction made of *Mallows*, *Marsh mallows*, *Pellitory of the Wall*, *Camomil*, *Melilot*, Roots of *Asparagus* and *Linsed*, with which Decoction the Womb may likewise be Injected, and with the remaining Herbs let a Cataplasm be made, adding a little Oil of *Lilies*, or *Hog's-grease*, and apply this very hot to the Belly. Besides this, let her Thighs and Legs be strongly rubbed down, bathing them with the same Emollient Decoction very Hot. But here bleeding must by no means be forgot, and if the Woman be very Sanguine, first bleed her in the Arm, and after when the Symptoms are abated, in the Foot.

Of the Inflammation of the Womb after Delivery.

Very often the stopping of the *Lochia*, do's cause an Inflammation of the Womb, and is the Death of most Women to whom it happens. Sometimes this Inflammation arises from some Hurt or Bruise.

An Inflammation of the Womb may be known, by being much more swelled after Labour than is Requisite, the Woman feels a very great Heaviness in the bottom of her Belly, and that is swelled and blown up almost as big as before Delivery, she has a difficulty in making Water, and going to Stool, or she perceives her Pain Encrease in voiding her Excrements (because the Womb presses the *Rectum*, and by its Proximity, communicates the Inflammation, as well as to the Bladder) to which add, that in this

case there is a High Fever, and great difficulty of Breathing, and a Hiccough, Vomiting, Convulsions, and Death soon follows if not timely prevented.

Contusions of the Womb often cause Abscesses and Schirrous Swellings, which continue for a long time, and sometimes end in incurable Cancers.

As soon as the Womb appears to be inflamed, extract or procure the Expulsion of all Extraneous Bodies, which may happen to be lodged in it, without doing the least Violence to it for fear of exasperating the Malady; correct the Humours by a Cooling Diet, and let the Patient use Food that Nourishes little, drinking only Broth (but not too strong) made of *Veal* and *Pullets*, with cooling Herbs, such as *Lettuce*, *Purslane*, *Succory*, *Borage*, *Sorel*, or the like; let her abstain from Wine, and drink a Ptisan, made of the Roots of *Succory*, *Dog-grass*, *Barley* and *Liquorish*; let her keep her self very quiet in her Bed, and not be Swathed too Strait; let her Body be kept open with simple Anodyne Clysters, without the least Sharpness, for fear of causing Throes, which extremely pain the inflamed Part, and of all Passions of the Mind, let her especially avoid Anger.

The Redundancy of the Humours may be Evacuated, and diverted by Bleeding; First in the Arm, and after in the Foot if there be Occasion. It is convenient to cover the Belly with *Galen's Emplaster* to cool it, or embrocate it with Oil of *sweet Almonds*, mix'd with a little *Vinegar*. Injections may likewise be made into the Womb, but these must be cooling only, without the least Astringency, (such as are made of *Barley-Water*, with Oil of *Violets*, or warm Milk are very proper) observing to use nothing which is excessively Cold, avoiding all sorts of Diureticks, and keeping the middle way in the Cure, for fear of inflaming the Womb by the use of hot Things, which provoke the Flux. Bleeding is good for the making an Evacuation, without any of these Consequences. But observe here, all Purges how mild soever, are hurtful in this Case, as well as in all Inflammations and Fluxions on the Womb, even the least that can happen.

Sometimes an Inflammation of the Womb is converted into an Aposthume, which yields a great quantity of Matter; in this case you must be contented with a good Regimen and Detergent Injections to carry off the Pus, and for this purpose you may make use of a Decoction of *Agrimony* with *Honey*, or *Syrup of Wormwood*, adding (if the Corruption be great) a little *Spirit of Wine*.

If the Aposthume degenerate into a Cancerous Ulcer, it will only admit of a Palliative Cure.

Of Schirrosities of the Womb.

Schirrous Swellings frequently proceed from the Application of Cold and Restraining Medicines to the Womans Belly, or injecting something of that kind into the Womb.

If the internal Orifice only is Schirrhous, the Womb is not larger than the common Size; but if the whole Body of it be affected, it is exceedingly Tumefied, and this often happens upon an Inflammation after Labour, or upon some disorder or suppression of the Courses. For the more certain knowing there is a Schirrosity in the Womb, lay your Hand on the Womans Belly, or introduce your Finger into the Womb, and you will find it big with an extraordinary Hardness. The inner Orifice is Larger, Harder, Shorter, and more unequal, than it ought if there be no Inflammation, or the *Schirrous* be not disposed to Cancerate, it is indolent, but if it be inclined to either of these, the Pain is very Great.

If the Womb be Schirrous, the Woman finds a great Lassitude, a weight at the bottom of her Belly, feels Pains in her Reins, Groins and Hips, and has a frequent Motion to make Water, and these Pains increase when she makes an Effort to void her Excrements, because the Womb compresses the *Rectum*, and the Bladder by its Weight. The Courses are entirely Suppressed, or in very small Quantity, or irregular, which is occasioned by the Obstruction of the Part.

The best way to begin the Cure, is by bleeding in the Arm, and gentle Purging, for violent Purging in this case is Hurtful, and exasperates the Disease, Emollient Oils, Greases and Cataplasms applied to the Belly,

and Emollient Injections into the Womb are serviceable, after which the Patient may use the whole or Half-bath. After she has for several days been treated in this Manner, let her bleed in the Foot, refrain from Copulation, and observe a cooling Diet to allay the Heat of the Blood. Thin Milk, especially that of Asses, is good in this Distemper, but the drinking the Mineral Waters, is yet better.

Of a Cancer of the Womb.

This is commonly the consequence of a Schirrosity, Inflammation or Aposthume, after Labour. Ill conditioned Whites, and virulent Gonorrhoeas of long standing, conduce very much to this, by the Erosion of the Womb.

It sometimes happens to Women upon a cessation of their Courses, because the Vessels being stop'd by degrees, the Blood brought to the Womb, stagnates, corrupts and ulcerates the substance of the Part, which soon becomes Cancerous.

When a Woman has a *Cancer* in the Womb, she feels a pricking Pain, and a heaviness which is caused by the sharpness of the Humours, and the bearing down of the Womb. This Pain extends to the Reins and Groins, and the Patient feels a great weight at the bottom of her Belly, and a general Lassitude of the whole Body; she has a difficulty of Urine, and a Serous, Foetid, Virulent, Blackish Gleet comes from the Womb. Sometimes the Blood comes away wholly Fluid, and sometimes it is concreted. When the Ulceration is in the inner Orifice of the Womb, it may be perceived by the Finger, or may be seen by the help of the *Speculum Matricis*; but if it be in the bottom, there is no way to know it but by the Condition of the Matter which comes from it, and by the Symptoms above mentioned. These Ulcers are very unequal, Sordid and Stinking, and the Corruption is sometimes so great, as to breed Worms.

Cancers of the Womb are incurable, and only admit of Palliating Remedies, which abate the violence of the Pains. The Patient must not take any thing Sharp, either inwardly or outwardly, for fear of increasing the Disease and Pain, and hastning her End.

Women who have a *Scirrhus* or Apostem in their Wombs, or who are subject to Flooding, or have a Cessation of their Courses, especially when they are advanced in Years, are most of all subject to *Cancers*. Such Persons as are threaten'd with this Disease, upon the account of the ceasing of their Courses, have no better Expedient than to bleed in the Arm at convenient times, to supply the Defect of that Evacuation, and by this means prevent too great a Redundancy of Blood and Humours in the Womb; and this they ought to do for several Years together, till those Vessels which conveyed the Blood are very much diminished. If such a Woman has been very subject to frequent Hæmorrhages, let her refrain from Copulation, because this Action brings Blood into the Part; let her observe a cool and moist Diet, and shun all Aperitive, Diuretick or violent Purging Medicines; let her drink new Milk from the Cow to sweeten the Blood, and frequently drink Broths made of Pullets, whose Bellies were first stuffed with the cold Seeds. The Cow whose Milk she drinks must be sound, and not overheated, fed with good Pasture, and one who has not lately calved; for all Errors of this Kind are dangerous.

Of a Looseness happening to a Woman newly laid.

A Looseness, when it happens to a Woman soon after her Delivery, is dangerous; because it diverts the Cleansings from flowing to the Womb, and by this means often proves fatal to the Patient. That which makes this Case dangerous is, that Remedies proper to stay the Flux, such as Astringents and Purgatives, are not to be admitted of, especially at first. In this Case therefore, give the Patient strong Broths, to strengthen her, and abate the Flux; give her Anodyne Clysters made of a simple Decoction of *Bran*, or the cooling Plants, either alone, or with the Addition of *Milk*, or the *Yelks of Eggs*, to abate the Pain; or let her take some Grains of *Laudanum* in the Yelk of an Egg. If the Looseness be accompanied with a Fever, let her bleed. However, if there be a visible Danger of the Woman's losing her Life by the continuing of the Flux, use all common Remedies in this Case, without the least

Scruple; and when that is stop'd, attempt to procure an Evacuation of the Cleansings, which for a time were suppressed.

Of Ruptures of the Belly in Women with Child.

The Womb sometimes is distended to so large a Size, that it breaks through the *Peritonæum*, and causes Ruptures so large, as to contain the Womb and Child in it. These Ruptures sometimes happen above and below the Navel, between the *Musculi Recti*, in the Navel it self, and in the Groins, which are the weakest Parts of the Belly. They commonly proceed from great Straining of a Woman in Labour, or vehement Vomiting, or violent and frequent Sneezing, or some accidental Blow on the Belly. This Disease causes Want of Digestion, Vomiting, and severe Colick Pains; and often, when the Gut which is fallen cannot re-enter, Death is the Consequence; or at least there is a Necessity of making an Incision into the Belly, as in a *Bubonocèle*.

To avoid Accidents of this Nature, the Woman must be forbid to lace her self, or straiten her Belly, that it may have Room to extend it self every way. But if she happen to have a Rupture, she must wear a Bandage with Compresses adjusted to the Part, to prevent the Guts from intruding themselves into the Swelling. -If the Rupture be in a Place into which the Womb can insinuate it self, the Woman must have an especial Care to prevent this fatal Accident, by the Help of good Bandages, and she would do well to keep her Bed during her being with Child.

Of an Inflammation of the Breasts after Delivery.

If a Woman with Child has received a Blow on her Breasts, or compressed them by lying on them, or has left too great a Quantity of Milk in them, without drawing them, an Inflammation will infallibly ensue, which sometimes is the Cause of Abscesses or Scirrhuses, which degenerate into *Cancers*. The Breasts being very sensible, when they are inflamed, soon produce a continual Fever with *Deliriums*.

The best Way to prevent an Inflammation of the Breasts is to procure a good Evacuation of the Cleanings, and if they are suppress'd, to provoke them, that so all the Humours, which flow'd too plentifully to the Breasts, may take their Course downwards. For this purpose bleed her first in the Arm, and then in the Foot. In the mean time embrocate the Breasts well with a Mixture of Oil of sweet Almonds, and after that apply Galen's cooling Emplaster, with a third Part of Populeum; or a Cataplasim made of the *Settlings found in a Cutler's Grindstone Trough*, and Oil of *Roses*, with a little *Vinegar*: Or if the Pain be violent, make a Cataplasim with the *Crumb of white Bread*, Milk, Oil of sweet Almonds, and the *Yelks of Eggs*, and apply it to the Breasts, and over that lay Compresses dip'd in *Oxycrate*, *Plantane Water*. But great Caution is to be used in Astringent Remedies, lest (if they be too strong) they occasion a *Scirrhus*, which in time may become cancerous.

After the Height of the Inflammation is over, let Discutients be used to dissipate the Milk, which flows in too great Abundance to the Breasts; but the best Way in this Case is to draw them by sucking; for if any great Quantity be left in the Breasts, it will necessarily suppurate. However, it is necessary to use discussing Applications first, because sucking brings Milk into the Breasts. But if the Milk runs off it self, leave it, for this is enough to empty them. Milk may be resolved by applying a Cataplasim of *pure Honey* to the Part, or rubbing them with a red Cabbage Leaf, having first deaden'd it by the Fire, and taking care not to straiten the Breast. The following Discutient is very good: Take a good red Cabbage, and boil it in River Water till it be soft, and the Water evaporated; pound this in a Wooden or Stone Mortar, and after pass it through a Sieve, adding Honey and Oil of Camomil, and apply this Cataplasim to the Breasts.

Let the Woman in the mean time use a cool Diet, not very nourishing, to prevent breeding too much Chyle; let her keep her Body open, that so the Humours may discharge themselves downwards while the Inflammation remains; let her lie in Bed on her Back, because when she is up, the Weight of her Breasts increases the Pain.

On the fourteenth or fifteenth Day after her Delivery, when the Cleanings are pretty well come away, and she is free from a Fever, she may be purged as often as seems convenient. If (notwithstanding the Use of these Remedies) the Pain does not abate, there is Reason to believe there is *Pus* in the Breasts.

Of the Curdling and Clodding of Milk in the Breasts.

About the fourteenth or fifteenth day after Labour, the Milk often is apt to Curdle, and then the Breasts become hard, unequal, and rugged, without any Redness, and all the Glands filled with curdled Milk, may easily be discerned; The Woman finds a great Pain, and cannot Milk them as before, she finds a shivering in her Back, which seems to be like Ice. This is followed by a Fever of four and twenty Hours Continuance, and sometimes less, if the clodding of the Milk do not turn to an Inflammation of the Breast, which will undoubtedly happen, if it be not emptied or dissipated.

This clodding of the Milk, for the most part proceeds from the Breasts, not being well Drawn, either because she has too much Milk, or the Infant is too Weak, or she has no desire to be a Nurse; for the Milk in these cases remaining in the Breast, Sowres and Clods: This Accident may sometimes happen from taking Cold, or keeping the Breasts not well cover'd.

The most certain Remedy in this Case, is to draw the Breasts speedily, till they are well Evacuated, but because the Woman is not soft Milch'd, and the Child cannot draw them strongly enough, let another Woman draw them till the Milk comes Freely, and then she may give the Child Suck; and to the end that she may not afterwards breed more Milk than the Child can Draw, let her use a Diet that yields but little Nourishment, and keep her Body Open. But when it happens the Woman neither can nor will be a Nurse, then her Breasts must not be Drawn, for fear of attracting more Humours, for the Disease will ever Recur, if they be not Emptied; wherefore it is necessary to prevent the coming of any more Milk into them, and to resolve and dissipate that

that which is there. For this purpose the Woman must be bled in the Arm, have strong Clysters given her. Bleeding in the Foot, and Purging, are very serviceable in this Case, and to resolve and dissipate the curdled Milk, apply some Cataplasin above recommended, as that of pure *Honey*, or the *four Meats* boiled in a Decoction of *Sage*, *Mint*, *Smallage* and *Fennel*, mixing with it *Oil of Chamomil*, with which Oil the Breasts may be well Anointed. Clothes laid over Pots of *Salt Butter* are very good, after having used all things proper to resolve the concremented Milk.

Of Apostems in the Breasts of a Woman new laid.

If a Woman feels a great Pain, and there be a stronger Pulsation in one place than another, a Hardness, a Livid Colour, with a Softness in the midst, it is a sign the Breasts will Apostemate.

To suppurate the Apostem, apply on the Breasts an Emollient and Ripening Cataplasin made of *Mallows*, *Marsh-mallows*, with their Root, *Lilly Roots* and *Linseed* bruised, and boiled to a Pap, that it may be pulped through a Sieve, and so no hardness may be left to hurt the Breasts, which at that time are in great Pain; after mix a good quantity of *Hog's-grease*, or *Basilicon* with it, or lay a little Cloth thick spread with the same *Basilicon*, upon the place where it is likely to Break, and the Poultis all over it, renewing it twelve Hours after, or at farthest next day, continuing this Remedy till the Apostem be Ripe. Or you may make use of the *Emplastrum Divinum*, malaxed with *Oil of Lilies*; this is preferable to all others of the like Nature, for this purpose. As soon as the Apostem is Ripe, it must be opened, if it open not of it self. The time when it is fit, may be known by the ceasing of the beating the Woman felt before in her Breasts, and that the Pain and Fever is very much Abated, and then besides the middle of the Apostem is raised to a Point, and very Soft, and the contained Matter may by the Finger be perceived to Fluctuate. The Apertion must be made with a Lancet, or with a grain or two of some Caustick, making it large enough to evacuate the concremented Matter. It is best to use the Lancet, be-

cause there is no loss of Substance, and the Scar is not so Disfiguring. The Orifice must be made in the most commodious Place, for the Evacuation of the Matter, taking care that none of the large Vessels near the Arm-pits be opened. After that all the Matter and putrified clotted Milk is not discharged, deterge the Apostem after the ordinary Manner, observing not to make the Tents too long, or too hard, but very soft Dolls of Lint, without thrusting them too far in, and fasten a Thread to the first to draw it out, if there be occasion, because these Apostems are most commonly Deep. If there be great Pain, dip the Pledgits in *Oil of Eggs*, or *Basilicon* mix'd with some Digestive, if there remain any thing yet to Suppurate; after this deterge the Ulcer with *Honey of Roses*, or *Unguentum Apostolorum*, laying on the *Emplast. Divinum*, to soften and discuss the remaining Hardness.

If there be several Apostems in different places of the Breast, in this case there is no need of laying open every one of these small Holes, but it suffices to make one or two Apertures in some depending part large enough, because the Breasts are Spungy, and these Apostems communicate with each other. But the most prompt Remedy, is to drive the Milk quite back; and for this purpose give the Woman Clysters, and purge her frequently, confining her to a Diet which is not very Nourishing.

You must not always stay till the Cataplasins break the Abscesses, and sometimes there is a necessity of opening them with a Lancet, because if the Matter Stagnate too long in the Breasts, it will corrode that Glandulous Part, and form Sinuosities very difficult to cure.

Of the Excoriation and Loss of the Nipples.

Very often Women that are Nurser, and especially the first time, and subject to have their Nipples Excoriated, for the small Holes of the Nipples not being sufficiently opened, the Child takes more Pains to Suck, than when the Breasts do almost run of themselves. Sometimes these Chaps and Excoriations, do so encrease by the Child's continual Sucking, that in the end it quite takes the Nipple off from the Breast, and the Wo-

man is no longer capable of giving Suck, and there remains an Ulcer very hard to be cured.

This may sometimes happen from Childrens biting and mumping the Nipples, and sometimes their Mouths are so Hot, that they make the Nipples Sore, as when they have those little Ulcers called *Apthe* or a Thrush, and much sooner if they have the Pox, with which they infect their Nipples.

These Excoriations if they are neglected, at length become very Malignant Ulcers. Wherefore as soon as they begin, let the Woman forbear giving her Child Suck, till they are perfectly Cured, and in the mean time drive back the Milk, for fear of an Inflammation, from too great abundance of it. If only one Nipple be Sore, she may give Suck with the other; to these sore Nipples Desiccative Medicines must be applied, as *Alom* or *Lime-water*, or they may only be bathed with *Plantain Water*, laying on them small soft Rags dip'd in those Liquors, or apply an Emplaster of *Cerufs* or *Pompholyx*, or *Starch*; but an especial care must be taken that nothing be applied which may disgust the Child, for which reason many only use *Honey of Roses*.

To prevent Hurts in these Parts, and hinder the Woman's Clothes from cleaving to them, let a little cap of Lead be put on, as well to defend them, as to give Issue to the *Sanies*, which proceed from those little Ulcers, or that the Milk which distills from the Breast, may pass that way.

If the Child has sucked off the Nipple, the Milk must then be quite dried away, because otherwise it would be impossible to cure these Ulcers, which in time would become Callous and Malignant.

If the Child be put to another Nurse, and the Ulcers in its Mouth have no Malignity, 'tis enough to wash them with *Barley-Water*, mix'd with a little *Juice of Cyron*, and let the Nurse use a cooling Diet.

When the Nipples are quite lost, the small Holes are closed up by the Ulcers, but if notwithstanding she shall desire to give Suck, another Woman may by degrees make her New Nipples, after the Ulcer shall be perfectly Healed, whose Sucking by degrees will draw them out, and by this means unstop

the Root of the Old Nipples; or if she have no Woman to Suck her, let her use a Glass Instrument, with which she may herself Suck them five or six times a Day, and to shape them and preserve them when they are drawn out, let her put on them a small cap of Wood.

Of the Swelling of the Legs and Thighs in a Woman newly Laid.

If the Swelling be very great, there be an Inflammation, and it proceed from Suppression of the Cleanings; if there be a Fever, difficulty of Breathing, a great Tension and Pain in the Belly, the case is dangerous. If there be but an indifferent Swelling only, without any of the above mentioned Accidents, there is no great difficulty in the Cure.

For this purpose, procure a good Evacuation of the Cleanings, give the Woman an Aperitive Pilsan, made with the Roots of *Fennel*, *Parsley* and *Dog-grass*, with a little *Crysal Mineral*: Sometimes give her an Ounce of *Syrup of Maiden Hair* in a Glass of the Pilsan, with five or six drops of the *Dulcified Spirits of Salt*, and about half a Dram of *Sal Polychrestum*. If she have no Fever, and it be fifteen Days after her Delivery, she may be Purged.

Of the Suffocation of the Womb after Delivery.

Some Women in Hysterick Fits have a high Pulse, others a very low one, as it were sunk in, others have scarce any at all; some become Pale and Motionless, others have a good colour in their Cheeks, and have several Convulsions; some have not the least appearance of Breath, and others breathe with great Difficulty, and great Heavings of the Breast; some are insensible, without remembring any thing they have done, or said; others never lose their Reason or Judgment, some are Gay and Merry, Laughing and Singing, others are Sad and Dejected. Some are attack'd with frequent Fits, others very seldom. The Fits sometimes last for several Hours or Days, and sometimes are suddenly over. The most ordinary Signs of the Hysterick Passion, are difficulty of Breathing, which causes a Suffocation with a great

a great Constriction of the Throat, as if the Patient had a Morsel which she could not Swallow, and the Throat were griped with a Man's Hand. There is a great Weakness and Palpitation of the Heart, *Nausea's*, and sometimes a Flux of Water and Serosities from the Mouth; frequent yawning, sometimes is a Fore-runner of the Fit. The Woman feels a Pulsation of the Arteries in the bottom of her Belly, a Leaping and Contraction of the Womb, a Rushing of Wind in the Stomach and Guts which distends them, and bears up the Diaphragm, sometimes she is delirious in the Fit, and has Convulsive Motions preceded by a Pain, Weight, and Dizziness in the Head, Dazling of the Eyes, Drowsiness and Forgetfulness. Sometimes after these Convulsive Motions, she is thrown into a Mortal Apoplexy, or a Palsie of one side, which continues for several Years.

To prevent this Distemper, if there be a Suppression of the Cleansings, bring them down by relaxing all the Parts round the Womb, and the Thighs by a Half-bath, by bleeding in the Foot and Purging. If it be a Big-bellied Woman who labours under this Distemper, let her only Bleed, and keep her Body open with Clysters. The use of the Mineral Waters is admirable, to prevent the Hysterical Passion, in case the Patient be not with Child. If the Suffocation proceed from any extraneous Body in the Womb, extract it, or procure its Expulsion by Medicines. Let the Patient avoid all sweet scented Things, all Sweet-Meats, or any thing prepared with Sugar, all melancholy and disturbing Passions, and keep her Body Open. If she be a Married Woman, let her often embrace the privileges of that State, if not, let her keep a cooling Diet, using Emulsions and Bathing.

In the Fit which is ordinarily attended with difficulty of Breathing, Suffocation, Weakness, Palpitations of the Heart, it is usual to present to the Patient things which have a very ill Scent, as *Partridge Feathers*, or Soles of Shoes burnt. Some sling a Drain of lighted *Campfire* into a Pot of Water leaving it till it be extinguished, and give this Water to the Patient to Drink; or give two or three Drops of Oil of *Amber* in a Spoonful of Broth, or *Orange-flower Water*. But the best way is to unlace

the Patient's Clothes, and give her a Spoonful or two of *Cinnamon-Water*, or *Aqua-vitæ*; this is a good Cordial, and promptly dissipates the Windiness in the Stomach, which is the cause of these Suffocations. A Spoonful or two of Wine alone is very good. Smelling to *Spirit of Wine* is better than Vinegar. The scent of *burnt Paper*, or a *Musket Match*, is very good. If she be with Child, she may not smell to stinking Scents, for fear the Miscarry. If she be not with Child, let her take Sneezing Powders, with Powder of *Betony*, or *Tobacco* without Perfume. You may put a Grain or Two of Salt into the Patient's Mouth, to bring away the Water and Serosities which flow thither in great abundance.

If any large Evacuations precede the Fit, as a great Loosness, or an immoderate Flux of the Whites, or a great abundance of the Cleansings, and the Woman's Pulse be Low and Languid, her Face Pale, and her Body Cold, you must forbear Bleeding; on the contrary, if she have a Florid Colour in her Face, her Pulse be High, and there be a Suppression of the Courses or Cleansings before, and she have Convulsive Motions, I think bleeding is very Proper; first in the Arm, and after in the Foot.

Of the Whites.

It is very difficult to distinguish Whites in Women, from virulent *Gonorrhæa's*. In the Whites the Matter is Whiter, more Serous, especially if it be Copious, and less foetid than in *Gonorrhæa's*. On the contrary, in Venereal Cases it is more Stinking, Thick, Blackish, Yellowish, Greenish, and sometimes is of a reddish Colour, by the mixture of a bloody Serosity. When a Woman has the Whites, the Courses become Irregular; sometimes instead of her Courses, she has a Flux of Blood which becomes Serous, and appears like the Water in which Flesh has been Washed; when it is a little abated, after some time some clods of black corrupted Blood come away among the putrid Matter. A Woman who has the Whites, can lie with her Husband without Pain, but she who has an Ulcer cannot. The Matter which comes away in the Whites, most commonly is White, Serous, not unlike Whey,

Whey, without any ill Scent, though sometimes it is Yellow, Stinks, and by its Acrimony causes a great smarting of the Parts. It is very difficult to distinguish the Whites from *Gonorrhœa's*. Women with Child are more subject to this Distemper, which is occasioned by the Suppression of their Courses. Few Women are wholly exempt from this Inconvenience, but at some time or other labour under it; but some are much more subject to it than others. Women who have not their Courses Regularly, those who are Phlegmatick, have a soft Skin, are pale Coloured, or lead a melancholy Sedentary Life, are most of all subject to the Whites; but young Girls who are not of an Age to have their Courses, never have them. The Whites weaken the Woman, humect and relax the Womb to that degree it cannot contract and close it self, and by consequence cause Barrenness. The Woman's Countenance becomes Pale, her Legs Swell, she loses her Appetite, has Pains in her Back, Weakness, Palpitation of Heart, and Hysterick Fits. If the Whites continue long the Woman is Emaciated, and becomes Hectical; Nay, sometimes such a Relaxation of the Womb ensues, that it becomes cancerous if Neglected.

For the Cure of this Distemper, Bleed and Purge the Patient well, and prescribe a good Diet to her; let her go to the Baths, and after drink the Chalybeate Waters, or others of the like Nature. Phlegmatick Women whose Flesh is Tender and Soft, ought to drink the hot Waters, as those of *Bourbon* and *Vichy* in *France* [or the Bath in *England*] or a Sudorifick Decoction made of the Roots of *China* and *Sassa-parilla*, taking for a fortnight before, a Glas of a Laxative and Diuretick Ptisane made of *Maiden Hair*, Roots of *Dog-grass*, *Asparagus*, *Smallage* and *Fennel*, with a Dram of *Senna*, adding every three days, four or five drops of the dulcified Spirit of Salt, or half a Dram of *Sal Polycressum*; and during this time, let her observe a good Diet, refraining from Copulation, and avoiding all Melancholy and Dejection of Mind. The most proper time to begin the use of Medicines, is immediately after the Courses are over. After these Medicines, the Patient may use Astringent Injections made of equal parts of *Plantain*

and *Myrrh Water*, but she must forbear when the time of the Courses is near, for fear they cause a Suppression; for my Part, I would not advise any Woman to use Styptic Applications, because this part is the common Sink, where all the Filth of the Body is Discharged.

When the Whites are very Acrimonious, and cause a smarting of the Parts, *Barley-water* or *Whey*, or simple Water may be injected three or four times a Day, (except in the time of the Courses,) to allay the Heat and Pain, prescribing a good Diet, and between whites, purging her till the cure be Completed.

Tho' the Patient may seem to be cured, and the Whites cease, or at least are very much abated, the Woman must notwithstanding frequently take Medicines, and all her Life observe a good Diet, otherwise she will be in very great danger of a Relapse.

Of Dieting and ordering a New-born Babe.

It is not usual to give a Child Suck, till ten or twelve Hours after its Birth, and then the Nurse must milk a little into its Mouth, and on its Lips, to give it a Relish, and when the Child has taken the Breast, she must squeeze it till it be accustomed to Suck of its own Accord.

If a Nurse have plenty of Milk, give the Child no other Food for the first two Months; but for the first two or three Days, give it but a little at a Time, for fear of overcharging its Stomach, and after encrease the Quantity. When the Child is grown a little bigger, you may give it either in the Day or Night, as much as it desires, a little and often; for if it take too much at a time, it vomits it up, the Stomach being too weak to digest it. But if you can govern the Child, it would be better to give it the Breast but once every two Hours, and never in the Night-time, unless when it wants Sleep.

After the Child has been fed the first two or three Months with the Breast-milk only, you may give him a Pap made of Flour and Milk, though but little at first, and not too thick neither, lest his Stomach be overcharged. That this may be easier of Digestion, put the Meal in an Earthen Pan in a

an Oven, as soon as the Bread is Drawn, stirring it often to dry it Equally. Pap made thus, is much better than the common Way; for being made with raw Flour, it is very difficult to boil it well, without consuming the best part of the Milk, leaving the thickest part behind, which by its long boiling loses its Goodness. When the Child has taken Pap thus made, which must be but once a Day, (especially in the Morning) or twice at most, the Nurse may give it Suck to wash it down into the Stomach, and dilute it there.

If a Pap be given to a Child newly Born, as some Women indiscreetly do, it causes Obstructions, difficulty of Breathing, Gripes, swelling of the Belly, and Convulsions; of all which Death is the Result, and therefore it is best to forbear the three or four first Months, provided the Nurse do not want Milk.

When the Child has sucked its Fill, let the Nurse lay it to Sleep, not in the same Bed she lies in her self, for fear of over-laying it, but in a Cradle close by her Bed-side, and let her put a Mantle over the Head of the Cradle, to prevent Dust falling on its Face, and the Day-light, Sun-shine, Candle, or Fire in the Chamber from offending it; let her lay it to Sleep, on its Back, with its Head a little raised upon a Pillow, and to make it sleep the sooner, let her rock gently with an equal Motion, without too great Shaking; but that she may not be forced thus to rock the Child every time she would have him to go to Sleep, it is best not to use him to it at first. He may sleep at any time in the Day or Night, and ordinarily the better he is, the more he Sleeps; however, if he exceeds in this respect, let his Nurse carry him in her Arms to the Light, sing some little Song to him, shew him some glittering Thing, or dance him in her Arms.

When he is in the Cradle, let it be so turned that the Light may be directly in his Face, that he may not be tempted to look aside; for doing so often, his Sight will be Perverted, and he become Squint-eyed. But the best way is to let him see no Light at all.

The Nurse must open and change the Child, at least twice or thrice a Day, and sometimes in the Night too, if it be necessary to cleanse him from his Excrements,

and shift the Blankets, which must be put into a Bucking-Tub, and not slightly washed, as most hired Nurses do; because there comes a certain Salt from the Excrements, which insinuates it self into them, and causes a great Itching, Smarting, and Excoriation of the Child's Body.

The Child must always be opened before the Fire, and his Blankets and Clouts well warmed and dried, before he be put into them, lest their cold and dampness, cause a Cholick and Gripes. The Nurse must put Rags behind his Ears, and under his Armpits, to dry up the Moisture. During the first four or five Days, she must be careful not to make the remaining part of the Navel-string fall off too soon, before the Vessels be closed, and every time she opens the Child, she must see whether the Navel for want of being tied fast do not Bleed; and after the end is fallen off, let her still for some time Swathe the Navel, continuing to keep a Compress on it till it be well Cicatrized, and something sunk in. Besides this, let her put upon the Mold of the Head, under the Biggin, another Compress to keep the Brain Warm, and prevent the Child's taking Cold. Let her also be very careful not to suffer the Child to cry too much, especially at first, lest the Navel be protruded outwards, and cause an *Exomphalos*, or a Rupture in the Groin. The best way to quiet him is to give him the Breast, and to lay him Clean and Dry, and present something to amuse and please him.

Some foolish Nurses use to suck the Child's Breast, to draw out the Serosities, and form a Nipple in Girls, but this is a ridiculous Practice; it suffices in this case to apply Rags dip'd in *Oil of Roses* and *Vinegar*, and forbear swathing the Part too Strait.

Of the Weakness of New-born Children.

Children sometimes suffer so much by a bad Labour, that it is difficult to know whether they are alive or dead, not any part of their Body having the least sensible Motion, and being as Blue and Livid, especially in the Face, as if they were Choaked. However, you may be assured a Child is alive; if laying the Hand upon the Breast you feel the Motion of the Heart, or touching

ing the Navel-string near the Belly, a small Pulsation of the Arteries may be perceived.

The best help in this case, is to lay him speedily in a warm Bed and Blanket, and carry him to the Fire, and there let the Midwife sup some Wine and spout it into his Mouth, repeating it if there be Occasion; let her lay Rags dip'd in warm Wine to the Breast and Belly, and let the Face be uncovered, that he may draw breath the easier, let her keep his Mouth open a little, and cleanse his Nostrils with small Linen Tents dip'd in White-wine.

Of Contusions or Bruises of a New-born Child.

Children frequently receive Bruises on the Head in their Birth, and sometimes have a Knob near as big as an Egg, especially if the Mother be in Years, and it be her first Child, because the inner Orifice of the Womb is Callous, and cannot be dilated without great Difficulty, and the Midwife sometimes does much mischief by handling it too roughly.

These Tumours are often so large, that they hinder the Artist from discovering which part Presents, and often times make them think it is the Shoulder which they feel. But this Errour is easily discerned, because these Tumours though feeling fleshy, are notwithstanding harder than any Shoulder or Buttock of a Child, which parts are always soft and without Hair, as the Head hath; besides the Bones may easily be perceived, if the Finger being anointed with Oil or fresh Butter, it can be introduced into the inner Orifice, for the Parts within the Womb are not Swelled. If a Child comes with any part besides the Head, and they remain a long time press'd in the Passage, they will swell likewise.

The best way to prevent these sort of Tumours, is to procure a speedy Delivery. To this end grease well the Internal Orifice of the Womb to relax it, and dispose it to give way for the Passage of the Child; and as soon as the Child is Born, foment the Tumours with warm Wine, or Spirit of Wine, and lay Compresses dip'd in the same on them; some Midwives only dip a Compress in Oil and Wine beat together. If a Tumour

will not be discussed by this means, but comes to Suppuration, the Matter must be let out as soon as is possible, for fear it corrupt the Bones of the Head; In this case it must be opened with a Lancet, and an Emplaster of Betony applied on the Wound. If it be any other Part than the Head which is Swoln, let it be wrap'd in Compresses dip'd in a Decoction of *Prevence Roses*, *Camomil Flowers*, and *Melilot*.

Some Male Children have the *Scrotum* very much swelled, which may proceed from a Contusion or Waters contained in it. In both these cases, Compresses dip'd in Wine, with *Roses* boil'd in it, must be applied.

The greatest Mischief is, when by the badness of the Labour or unskilfulness of the Midwife, a Leg or Arm is broken or dislocated; if this happen a Surgeon must be called, and the part dress'd after the same manner as in grown Persons, having regard to the Weakness and softness of the Bone.

Of the Mould and the Sutures of the Head being too open.

Very often Children who come before their time, have the Mould of their Head, and the Sutures open. This arises from the distance and separation of the Bones from one another, which are not Steddy, but may be moved to and fro, and yield on every Side. When this happens, you must not think to bring the Bones together by binding the Head Strait, for this would press the Brain which is very Tender, and kill the Child. It is sufficient to bind them softly with a small Cross-cloth, to prevent the inconvenience of their being unsteady, and commit the rest to Natures Work, which in time will unite the Bones.

There are some Children which have the Mould open till they are three years old more or less, according to their Strength. In this case, 'tis convenient to cover the part with a Linen Cloth three or four times double to prevent taking Cold, and to defend the Brain from external Injuries.

It happens sometimes, that although the Bones be big enough to unite in all Parts; yet they are separated from each other in the place of the Sutures, by a quantity of Waters contained between them and the *Dura*

Mater, and sometimes between the Skin and the *Pericranium*, or the *Pericranium* and the Skull, and sometimes in the *Sinus* of the Brain it self. If the Water is contained between the Teguments and the Bones, and the swelling be not very Large, the Child may be cured by opening and evacuating the Waters, or discussing them.

Of Gripes and Pains in the Belly of a young Child.

Many Children are so griped, that they cannot forbear crying out Night nor Day. This is the first Distemper which happens to them, and they often die of it.

The principal cause of these Gripes, is the *Meconium* which is contained in their Guts, which by its long stay there grows Sharp, and pricks their Membranes, or becoming Hard, the Infant cannot void it, nor the new Excrements, which proceed from the Milk which he first Sucks. It sometimes happens because the Child not being able to Suck with ease, he swallows in sucking the Milk with Difficulty much Air and Wind, which being retained in the Stomach, and sliding into the Guts does distend them, and cause a great deal of Pain.

This Wind is sometimes caused by a Child's taking a greater quantity of Milk than he can Digest, or the Woman giving her Breast-Milk soon after Labour, before it be Purified, or perhaps because the Child has taken Cold. Very often these Gripes proceed from giving him Pap too soon, or not well Boiled; because this is Gross, Viscous, and apt to engender Wind in the Stomach. Worms sometimes by their stirring and biting, do very much torment Children. In the last place, the Midwife may have caused this by forcing back the cold and clodded Blood out of the Navel-string before it be tied.

To avoid these Pains, the Nurse must avoid giving the Child Suck till the next Day, lest the Milk mix with the Excrements, and so corrupt and grow fowr, encreasing the quantity by little and little, till the Child be used to this sort of Food. If it be the *Meconium*, which by its long stay causes these Pains, give them at the Mouth a little Oil of *Sweet Almonds*, or Syrup of *Roses*, and

put a Suppository made of *Bete Stalks* into the Fundament, or a *Sugar Almond* dip'd in *Honey*, or a small Clyster.

If the Child cannot suck, and this proceed from its being Tongue-tied, the *Franum* must be cut in the Manner shall be taught in its proper Place; and if the Nurse be hard milch'd, change her for another.

Whilst the Child is griped, give it no Pap; because this Food does create Obstructions, breed Wind, and often cause Convulsions.

If the Gripes proceed from Worms, lay a Cloth dip'd in Oil of *Wormwood* mix'd with *Ox Gall* on the Belly; or a small Cataplasim made with Powders of *Rue*, *Wormwood*, *Coloquintida*, *Aloes*, and the Seeds of *Citrons*, incorporated with *Ox Gall* and Flour of *Leupines*; and if it can take any Thing by the Mouth, give it a small Infusion of *Rhubarb*, or half an Ounce of compound Syrup of *Sucory*, having before given it a small Clyster of *Milk* and *Sugar*.

When these Gripes are caused by Wind, or any sharp Humours in the Guts, anoint the Child's Belly all over with Oil of *sweet Almonds*, or Oil of *Walnuts*, *Camomil*, and *Melilor*, mixed together, (having first warm'd them) in which also a Cloth may be dip'd to lay upon it; or a small Pancake may be made with an Egg or two fried in Oil of *Walnuts*, and applied to it; or you may give the Child a little Anodyne or Carminative Clysters, as Occasion requires, ever keeping him very warm.

Of the Inflammation, Ulceration, Shooting forth or Rupture of the Navel of a young Infant.

If the Navel-string fall off before it be entirely closed and cicatrized, there happens an Inflammation, and Ulceration at other times. Although it be outwardly healed, yet not being to within, it is dilated, and protruded out till the Tumour be as big as an Egg, which is called an *Exomphalos*. This proceeds from the continual Cries of the Child, or some violent Cough.

In this Case, endeavour by all means to appease the Child's Cough, and quiet it to prevent its continual Crying, without which the Tumour would daily increase. If the Child's

Child's Uneasiness proceed from the Gripes, they may be remedied in the Manner above directed. If the Navel be inflamed, apply *Galen's Cerate* mixed with a Moiety of *Populeon*, or a small Compress dip'd in a Mixture of *Oil of Roses* and *Vinegar*, or *Unguent of Roses* with *Album Rhasis*.

When the Ligature is come away, and the Navel is ulcerated, apply Desiccatives and Restricting Medicines, as Rags dip'd in *Lime Water* which is not too strong, or *Plantane Water*, with a little *Allum* dissolved in it. If the Ulcer be very small, lay on it a little Pledget of dry Lint: Some add a little Powder of a rotten Post. These Medicines are better than Emplasters, which are never so drying, by reason of the Greases and Oils in their Composition. *Ceruss Emplaster*, or *Desiccativum rubrum*, or *Diapompholygos*, are the best; in applying which, you must observe to lay a Compress of Rags, and keep it on by swathing the Part, till the Navel be entirely formed; for the Child, by its crying, breaks the Vessels, or causes an *Exomphalos*.

As to the Rupture of the Navel in young Children, the Cure of it must not be undertaken otherwise than by Swathes and Compresses fitted for the purpose, at least till such time as they are grown to a competent Bigness; and then if these do not effect the Cure, you may perform the Operation.

If after the Inflammation there ensues an Apostem, the Child most commonly dies; for if it be opened to discharge the Matter, the Guts protrude themselves out as soon as the Child begins to cry. If the Surgeon be solicited to make the Operation, let him deliver his Prognostick, that to the Child's Death, if it should so fall out, may not be imputed to him.

But if the Apostem be small, and the Child has Courage and Strength enough to endure it, let him open it a little, which possibly may free the Child from this Inconvenience.

Of the Smarting, Redness and Inflammation of the Groins, Buttocks and Thighs of an Infant.

If the Nurse does not keep the Child very clean, the Acrimony of the Excrements

will not fail to cause a Redness and Smarting, and Inflammation of the Groins, Thighs and Buttocks: She must therefore keep it very cleanly, use a cooling Diet her self, and refrain from all Things which are apt to heat the Blood, that so the Heat of the Child's Water may be allay'd. Let her bath the Part inflamed with *Plantane Water*, adding a fourth Part of *Lime Water*: Or, if the Pain be very great, foment it with lukewarm Milk. Many Women use Powder of a rotten Post, or a little Mill Dust, which they strew on it. *Album Rhasis*, or *Diapompholygos* spread on a Rag in form of an Emplaster, is not amiss; but the best of all is a Lotion of *Saccharum Saturni*, the Effect of which may be seen in an Hour after. When the Nurse opens the Child, let her be careful to wrap the inflamed Parts with fine white Rags, that they may not, by rubbing together, be more galled and pained.

Of Ulcers or a Thrush in the Mouth of a Child.

Very often the Milk of a Nurse that is red-hair'd, addicted to Drinking, or very amorous, by its Heat and Acrimony, causes small Ulcers in a Child's Mouth, which are called *Aphthæ*, and sometimes Cankers. Some of these are simple and superficial, and are cured with much Ease: Some again are ill-conditioned, and caused by a pocky Venom, and happen after malignant Fevers, or are scorbutick and putrid: These spread themselves to the Throat, make deep Escars, and often are mortal to Children, because they want Strength to undergo the Cure.

To cure Ulcers in the Mouth, you must take care to allay the Heat of the Nurse's Milk, prescribing her a cooling Diet, (and bleeding and purging her, if she be plethorick) and wash the Child's Mouth with *Barley* or *Plantane Water*, and *Honey of Roses*, or *Syrup of dry Roses*, mixing a little *Verjuice*, or *Juice of Citron*, to deterge the viscid Humours, and cool the Mouth. For this purpose, fasten a dry Rag to the End of a little Stick, and dip this in any of the above-mentioned Medicines, apply it gently to the ulcerated Part, to prevent the Inflammation from being increas'd by a violent Rubbing. During this, the Child's Body must be kept open.

If the Ulcers participate of any Malignity, let such Topicks be applied as will have a prompt Effect. For this purpose, touch them with *Plantane Water* sharpen'd with *Spirit of Viuriol*, taking care to prevent the Child from swallowing it. The Remedies must be so much sharper and stronger, as the Ulcers are deeper and more malignant. As soon as they are cauterized with this Water, let the Child's Mouth be washed with a Decoction of *Barley*, *Agrimony*, and *Honey of Roses*; or touch them with the same as often as you shall think convenient, at least till a Stop be put to their spreading. Some rather chuse to cauterize these with small Tents of *Rags* dip'd in boiling *Oil*; because they apprehend, if the Child should swallow them, that they could not in the least prejudice it. It will not be amiss to purge off the ill Humours in the Child's Body, by giving him a little clean *Cassia* or *Syrup of Succory* with *Rhubarb*. If the Ulcers are venereal, these Remedies will have little Effect.

Of the Pain and other Accidents in breeding the Teeth.

The breeding of Teeth is the Cause of a great many Accidents, and often proves fatal to Children. In the time of their cutting, they are troubled with Inflammations of the Gums, Fevers, Convulsions, Loosenesses, especially when the Dog or Eye Teeth cut, and the Child is large, full of Humours, and costive.

When the Teeth cut, the Gums and Cheeks swell, there is great Heat and Itching, which often makes Children put their Fingers into their Mouth to rub them, from whence some Moisture distils down into the Mouth, because of the Pain they feel there; the Nurse, in giving them suck, finds the Mouth hotter; they are very much changed, and cry every Moment, and cannot sleep, or but very little; and small Points of the Teeth may be seen and felt through the Gums, which appear thin and pale on the Top, and red and inflamed on the Sides; and if it happens to be a long time e'er they cut, or that too many of them cut at a time, the Pain is so excessive, that it sometimes kills the Child.

To prevent these Accidents, the Nurse must keep a good Diet, and use all Things

that may allay the Heat of her Milk, for fear of putting the Child in a Fever, who already is very much in Pain; and let his Body be kept open with Clysters, if he be bound.

To help the cutting of the Teeth, let the Nurse from time to time pass her Finger over the Child's Gums, gently rubbing them; and give him a Stick of Liquorice to champ, or a little End of a small new Wax Candle, which is very good to soften the Gum; or a silver Coral, with small Bells, to divert him from thinking on the Pain he feels. Some Women, instead of a Coral, put a Wolf's Tooth in. If the Gums are hard and thick, these Things do no good: Some Nurses make an Incision with their Nail; but 'tis better done with a Lancet, because that is not so painful, and makes no Contusion.

If the Pain in cutting of the Teeth cause Convulsions, open the Gum with an Incision-knife, going so deep till you feel the Hardness of the Teeth with the Instrument; keep the Child's Body open, forbear giving him Pap, anoint his Belly with some Purgative Syrup, and the hinder Part of his Neck with *Oil of Lillies*, and let the Nurse observe a good Diet.

Of a Looseness in Children.

Children being wholly fed with Liquids, the Fibres of the Stomach are relaxed, which is apt to cause a perpetual Looseness. This often happens by reason of the great Pain which attends the cutting of the Teeth, and sometimes from the Sharpness of the Milk, which irritates the Guts.

A Looseness which is of no long standing, and without a Fever, is not to be accounted dangerous; but if it continue long, it will be convenient to put a stop to it, for fear the Child be too much weaken'd by it. For this purpose, let him suck well purified Milk, giving but a little at a time, to the end he may the better digest it; give him an Infusion of *Rhubarb*, to purge away the ill Humours. Gentle Anodyne Clysters may be likewise given, with *Milk*, *Yelks of Eggs*, and *Honey of Roses*; but after Purgings, let them be made with *Plantane Water*. You may likewise mix the Yelk of an Egg in the

Pap

Pap he eats, rub his Belly with Oil of *Quinces*, and lay upon his Stomach Compresses dip'd in Red Wine, in which *Provence Roses* have been boiled.

Of Vomiting.

Vomiting in Infants is frequently the Occasion of other Distempers, if it proceeds too far. It most commonly proceeds from their drawing more Milk than their small tender Stomachs can retain and digest. Sometimes the Badness of the Milk, the Nurses dancing the Child too much, a violent Cough, or too great a Compression of the Stomach, are the Causes of this Accident; to all which the Sweetness and Lukewarmness of the Milk contribute much.

When the Child sucks more than it should, the Nurse must not give it so much, and but a little at a time. If the Milk be bad, let the Nurse be changed for a better; if the Vomiting be caused by a Cough, some proper Remedies must be used to appease it; if by the dancing of the Child, the Nurse must forbear shaking it so rudely; if from a Compression of the Belly, Care must be taken that it be not swathed so strait. If there be any ill Humours in the Stomach, it will be convenient to purge the Child with a gentle Infusion of *Rhubarb*, or half an Ounce of compound Syrup of *Succory*: And after this, if judged necessary, it may take a little Syrup of *Quinces*; and Compresses dip'd in an Infusion of *Provence Roses*, *Cinnamon* and *Cloves*, in Red Wine, may be laid on the Stomach.

Of Ruptures in Children.

The most frequent Causes of this Accident are their vehement Crying and violent Coughs: Besides, the Moisture and Softness of their Bodies do not a little contribute to this. In the last Place, too strait Swathing by forcing down the Guts often causes Ruptures.

This Mischief must be remedied as soon as discovered, because the continual Descent of the Gut dilates the Place through which it falls every Day more and more. Ruptures in Children are more easily cured than in grown Persons.

Whilst Children are in swaddling Clouts, the Cure of true Ruptures, which happen to them, must not be undertaken but by a

Swathe-band, which is sufficient. This is effected by a Roller, putting a Compress or Truss just upon the Rupture, after having first reduced the Gut and *Omentum* into their natural Place. To do this, lay the Child with his Head low, then with both Hands reduce them by degrees, thrusting the Tumour with one Hand, and putting in the Gut with the other. After the Guts are reduced, lay a thick Compress on the dilated Place, and swathe it in the same Manner as was directed in the Rupture of the Groin or *Bubonocele*. Because it is very difficult for a Nurse to make this Bandage, a small Truss may be used instead of it, which must be waxed, to prevent being rotted by the Child's Water, and more than one must be had in readiness for change. For the better curing the Child, let him be kept in Bed forty or fifty Days, and Care be taken to prevent his Coughing and Crying, and his Belly must not be compressed. Some foment the Place with *Smith's Water*, and then lay on *Emplastrum ad Herniam*.

The *Hydrocele* or *Hernia Humoralis* is a Collection of Waters in the *Scrotum*. To resolve these Tumours, use *Spirit of Wine*, or a Fomentation made of a Decoction of *Camomil*, *Melilot*, *Rue*, *Marjoram* and *Fennel*, and apply Compresses dip'd in it to the Part; and after this, dry the *Scrotum* with a Solution of *Allum* in *Lime Water*; and to strengthen the Part, lay Compresses dip'd in a Decoction of *Roses* and *Allum* in Red Wine.

If these Remedies are ineffectual, make an Aperture with the Lancet to evacuate the Waters.

Of Scabs upon the Head and Face of young Children.

These are seldom malignant; and it is a Mark that they are not so, when they are only superficial, moist and yellow; and when their Crust is removed, the Skin appears of a red florid Colour, without any notable Ulceration.

The Humours must never be repelled, because the Discharge they make is useful to preserve the Body from ill Distempers, and the Child ever has its Health best when they come out. However, to prevent the breeding of ill Humours, take care that the Nurse

be a Sound and Healthy Woman, keep the Child's Body Open, and purge it now and then with a little Syrup of *Roses* or *Succory*. The crust must be digested and brought off, to give the Matter a better Issue; for which purpose you may make use of fresh Butter, or Oil of *Sweet Almonds*, laying on a *Cabbage* or *Bect Leaf* after, which must be renewed twice or thrice a Day, to avoid the offensive Scent. Continue the use of these Remedies till the Child be Cured, ever endeavouring to procure a plentiful discharge of Matter, after which Nature will finish the rest of the Cure. In the mean time, keep the Child's Hands tyed to prevent his scratching his Face, which would inflame it more, and bring down a Flux of Humours.

Of the Small-Pox and Meazles in Children.

The Small-Pox is a Disease in which abundance of small Pustles do break out all over the Body, which grow White, and after Ripen. The Symptoms of the Small-Pox and Meazles are so very like, that it is difficult to distinguish them on the first, second, or third Day.

The Signs which precede the Eruption of the Pox are a Fever, *Stupor*, a great Beating and Pain of the Head, Lassitude, a Pain in the Back, Sickness, Vomiting, Difficulty of Breathing, Yawning, Sneezing, Itching of the Nose, Inflammation of the Eyes, a general weariness of the whole Body, and a Urine very Turbid. As for the Eruption upon the third or fourth Day, a great many small Pustles arise, which encrease in bigness and number till the eighth or ninth Day; at which time they grow White, and gradually Ripen; and the Face and Head Swell, the Eyes are closed by the distention of the Eye-lids, the Nose is stop'd, the Voice grows Hoarse, there is a dry Cough, a Pain in the Throat, and a great difficulty of Breathing; if there be abundance of Pustles, the whole Body is Swoln.

There is a sort of Small-Pox void of Malignity, this at first is attended with a Fever, which ceases immediately after the Eruption, the Pustles rise to a Point, suppurate kindly, and are soon Well. The Matter is White, Uniform, and well Digested: When the Distemper is Malignant, the Pustles are

Brown, Flat, Livid, or ill Coloured, have little black spots in their middle, break out more slowly than when they are Kind, have no Digestion at all, or at least a very bad one, are filled with a Sanious Matter, attended with a Malignant Fever, *Delirium*, difficulty of Breathing, *Syncope*, and Dysenteries; sometimes they leave behind them Malignant Ulcers, Carosity of the Bones, loss of Sight, Deformity of the Face, or Lameness of some Limb.

If the Fever be not very High, and abate in proportion to the Eruption of the Pustles, if they be not very Numerous, and grow White, and ripen quickly, the Distemper is not very dangerous; but if the contrary happen, it is a sign of Death. The Small-Pox in Children, is not so dangerous as in grown Persons, because their Skin is more Soft and Porous, so that they break out more kindly than in those who have the Skin more Compact, and the Pores not so Open.

The Meazles are never so dangerous as the Small-Pox, because the Peccant Matter Transpires more easily and quickly. These are most commonly over in three or four Days, after which the Pox sometimes appears, which occasions the one Distemper to be mistaken for the other.

For the more successful curing this Distemper, prescribe the Child a good Diet, let her forbear all solid Meats, and feed only on Liquids; such as Veal or Chicken Broth, or a little Gelly. Let him drink a Ptsan of *French-Barley*, Roots of *Dog-grass*, *Liquorice*, and *Raisins of the Sun*. Never give Pap to a Sucking Child, till it be perfectly Recovered, and let the Nurse keep a cooling Diet. Do not suffer her to carry her Child into the open Air, but let her keep it close in the Chamber, neither too Hot nor too Cold; for too hot an Air dissipates the Spirits, and too cold an one stops the Pores, hinders Transpiration, and checks the Eruption. The Child's Sleep must be Moderate, and his Belly kept Open. If the Small-Pox be attended with a High Fever in the beginning, together with a difficulty of Breathing, and other like Symptoms bleeding is necessary. Purging in the beginning of the Small-Pox is not to be admitted, for fear of turning the Course of Humours which

which tend toward the Skin, but after it is proper to evacuate the remaining Impurities.

From time to time to give the Child all sort of Cordial and Strengthening Things, such are a pure Air, good wholesome Food, Juice of *Oranges*, Syrup of *Lemons*, and *Pomgranats* in the *Ptisan*, or a little Wine alloy'd with Water, but if it be a sucking Child, Milk must serve in stead of all other Cordials.

As soon as the Pustles begin to appear, anoint them with Oil of *sweet Almonds*, rubbing them with a Feather dip'd in it. Some use *Cream*, *fresh Butter*, or *stale Lard*, melted and washed in *Rose-water*, and beaten up in a Marble Mortar, and with this they grease them till they are perfectly Cured. When the Pustles are ripe, which may be known by their Whiteness, and Itching, which usually is about the ninth Day, the biggest of them may then be pierced (by a Gold or Silver Needle, or by cutting the tops with a pair of Scissars) to discharge the Matter, lest by its too long stay it ulcerate and corrode the Part too deeply. Afterwards to dry them up, anoint the Face with a Lintment made of fresh *Cream*, mixed with *white Chalk*, continuing this Remedy till the Scabs be quite fallen off, using it Night and Morning, or make use of *Ointment of Roses*, with a little powder'd *Cerufs* mix'd with it.

To prevent the Small-Pox from causing too great a Defluction on the Eyes, apply cooling Remedies, as *Rose* and *Plantane-water* from the beginning; Breast-Milk is very good to bath the Eyes with; Let the Nurse from time to time unstop the Child's Nose, that so he may breath with more Ease. Give him sometimes a little Syrup of *Violets* to smoothen his Throat, or give him a little Syrup of *Lemons* or *Pomgranate*, but Milk alone is sufficient for a sucking Child.

How to cure the Venereal Pox in Children.

If the Mother have the Pox when the Child is born, it will infallibly be infected by her; and this may be easily discovered when it is so, by Pustles and Ulcers, in all parts of the Body, especially in the Belly, Fundament, Head, and between the Legs.

If the Nurse who gives it Suck be Poxed, she will communicate it to the Child with her Milk. In this case, the Distemper first appears in the Child's Mouth, and the sharpness of the Milk makes several Ulcers in it. But we must not presently conclude the Nurse has the Pox, because the Child has Pustles in several parts of its Body, for these sometimes proceed from the Milk being overheated, and therefore some other Symptoms must be look'd for before you can be assur'd of it.

There is nothing farther necessary for the cure of simple Pustles, than changing the first Nurse, and giving the Child to another whose Milk is Sweeter, and who will take care to keep it Clean. But Children who come into the World with the Pox on them, most commonly die of it, and those who receive it from their Nurses, are very difficultly Cured, their tender Age being unable to support the Fatigue of Medicines.

If the Nurse be Poxed, take the Child from her and give it to one who is Sound, who must be confined to a cooling Diet. Let the Nurse wash her Nipple with Wine every time she gives the Child Suck, and let her Purge from time to time, for fear of being Infected. If no Nurse can be found who will venture to suckle the Child for fear of being infected her self, take one who has abundance of Milk, and let her squeeze her Breast and drop it into the Child's Mouth, or let her Milk her Breast into a Porringer, and give it a Spoonful now and then, or let her put her Milk into a Funnel, at the end of which there is fasten'd a Rag rowl'd up, and put this into the Child's Mouth for him to Suck, or dip Rags in her Milk, and let him suck them. But the best way is to let him suck a young Goat, fed on purpose with good Hay, and other convenient Things.

Let the Child be Bled and Purged, and after if he have Strength enough, anoint him with a Mercurial Ointment, rubbing only the Pustles and Ulcers, in doing which and reiterating the Frictions a small Flux will be raised by degrees, which must be almost insensible, lest the Humours being stirred and carried in too great abundance to the Mouth, cause it to Swell and Ulcerate,

and hinder the Child's Sucking: Wherefore but a small quantity of Mercury must be mixed with-Ointment, and after one Friction or two, you must forbear five or six Days, and see how the Flux will Rise, and then if there be occasion, give a few Grains of the Mercurial *Panacea* in the Child's Pap. Let the Nurse wash its Mouth with a Lotion of *Barley Water*, with the addition of *Honey of Roses*, or *Syrup of Wormwood* with *White-wine*, to clear it from the Froth which is usually gathered about it, and that he may void the Drivel better, let him lie upon his Side, and not upon his Back, lest falling upon the Stomach, or upon the Lungs, it should choak him. Let him be always kept warm without carrying him into the Air, and watch diligently the effects of the Medicine.

The common way to make this Mercurial Ointment, is thus; take half an Ounce of *Quick-silver*, pass it through a Leather to clear it from its adhering Filth, and then mix it in a Mortar with four Ounces of *Hog's-grease*, till it be very well incorporated; then take two Drams of this Ointment for each Friction, more or less in proportion to the Child's Strength.

How to chuse a good Nurse.

The Mother is doubtless the best Nurse that a Child can have, if there be no reason to the contrary. The best Age for a Nurse, is from 25 Years to 35, because about that time a Woman is stronger and more healthy than at any other. The common Opinion is, that a Woman is most fit to be a Nurse, two or three Months after her Delivery, because at that time the Milk is Purified, and her Body purged by her Cleansings, but she cannot be so much longer, because in this case the Milk would not continue so long, as would be necessary to suckle the Child. She must not have Miscarried, but had her Child at due time. The Milk of a Woman who has been Delivered of a Male Child, is commonly thought to be best, and it is to be preferred if it be her Second Child, because she may then very well be supposed to have some Experience in the Ordering and Managing her Infant. *Mauriceau* prefers Milk of a Fortnight Old,

to that of three or four Months, and if it be for a Girl, he prefers a Nurse who has a Girl, to one who has had a Boy.

She must be Sound and Healthy, and born of Parents who were so, and never had the Stone, Gout, Kings-Evil, Falling-Sickness, or any other Hereditary Distemper. She ought to have a clear Skin free from all Scabs, Itch or Scald; she ought to be strong and able to watch and tend the Child as occasion Requires. It is convenient she be of a middle Stature, neither too large nor too little, too Lean or too Fat; but above all, she must not be with Child. Let her Complexion be Sanguine, and her flesh Plump and Firm. She must not have her Courses, for that is a sign her Blood is too Hot, or she is too Amorous; she must not have the Whites, for these are a sign of a bad Habit, she must not be red Hair'd, or mark'd with any Spots, but her Hair must be Black or of a Chestnut Brown. She must be well Shaped, neat in her Clothes, and handsome in her Face, having a sprightly Eye, and smiling Countenance; she must have good Eyes, sound and white Teeth, and ought to have a sweet Voice, to sing to and please the Child. She must have no ill Scent come from her, as usually red Hair'd Women have, and not those who have black Hair and a white Skin, for their Milk is Hot, Sharp, and of an ill Taste and Scent; she must not have a strong Breath, as they who have a stinking Nose, and bad Teeth, because she would infect the Child's Lungs by often drawing in the corrupted Air.

Her Breasts ought to be pretty large to contain a sufficient quantity of Milk; they ought to be pretty firm and plump, and not flabby or hanging down; for a large strutting Breast is the Mark of a good Habit of Body. As for the Nipples they must be well Shaped, not too big nor hard, nor callous, nor sunk in, but they must be raised, and have several small Holes that the Child may suck without any great Pains; she must have Milk sufficient, and not in too great Excess, because the Child not being able to draw it, it grows stale in the Breast, and by its long stay there, turns sour and curdles; and therefore she may let another Child suck the Remainder. Her Milk must not be too thick nor too watery, which

may be known by milking it into the Hand, and the turning it a little on one Side; for if it run off immediately, it is a sign it is too Fluid, but if it do not run off at all, it is too Thick; the good is of a consistence between both, which runs off gently in proportion to the inclining of the Hand, and leaves a Trace behind it. The whitest Milk is the best, and the farther any recedes from that the worse it is, it ought to have a pleasant Smell, and ought to be well tasted; that is, sweet and sugar'd, without any Acrimony or Heat. But we must not forget one principal Condition of a good Nurse, and that is, that she be an honest and conscientious Woman, because these qualities will make her sober and careful of her Charge, and preserve her from Drinking and Venery.

How to prevent Childrens growing Squint-eyed, Awry, Crooked or Lame.

To prevent a Childs becoming Squint-eyed, chuse a Nurse whose Sight is firm and straight, lest by her ill Example, he get a bad Habit, Children being wondrous apt to imitate what they see done. Let his Cradle be ever so placed, that he may always have the light before him, because when it is on one side, the Muscles of the Eye are apt to act independently on one another. To redress this Inconvenience, let the Child wear a Mask upon its Face with two small Holes right against the Eyes to see through, which will cause him perceiving no Light but through them to direct his Eyes that way, and by degrees quit the ill Habit he has got of looking aside.

To prevent the Childs growing Crooked, Awry, or Lame, the Nurse must swaddle his Body Strait, equally extending his Arms and Legs, and swathing his Body sometimes one way, sometimes another, lest if she should swaddle it always alike, the parts should retain an ill Figure. The Nurse must lay him on his Back Straight, and not bending, and when she holds him in her Arms, let her carry him sometimes upon one, and sometimes upon another, for holding his Legs always in the same Fashion, it would be a great Hazard if they did not grow Crooked, and this Compression, especially

about the Knees, is the cause why so many Children have crooked Legs.

When any Parts have contracted an ill Figure, from whatever cause it proceed, let this be remedied with Swathes and Compresses conveniently placed, to keep the Part in a good Posture, whilst the Child is in his Clouts. When he is grown a little bigger, small Leather Boots may be used to straighten the Legs; if the Foot only be awry, Shoes underlaid of one side higher than the other, will serve the turn. When the Breast or Back-bone are in fault, it must be helped if possible, or at least hinder'd from growing worse, by a little Bodice of strong Whale-bone very well lined on that side where it jets out. A Cro's made of Steel is now in use, the traverse of which passes over both Shoulders, and the perpendicular lengthways of the Body, this Instrument is very convenient, and does not appear.

Those who would seriously apply themselves to the Practice of Deliveries ought to have that excellent Piece of the famous M. Mauriceau on this Subject ever before them, and read it Day and Night. I dare engage the intelligent Reader will perpetually find new matter in it. This is a Noble, Useful and Lasting Monument, from which Posterity will reap great Advantages

REMARKS.

Mauriceau assures us, he delivered a Woman of a Dead Child, which she had retained in her Womb for two Months, after being severely exercised with a violent Cough. Though the Child was entirely strip'd of its Scarf-skin; yet it had not the least ill Scent, being kept in this manner from all manner of Cadaverous Putrefaction. The Mother retained it to the end of the ninth Month, without any notable inconvenience, and continu'd in perfect good Health till after her Delivery.

The same Author relates, *Obs.* 465. that on the 21st of November 1686. He laid a Woman nine Months gone with Child of a Girl perfectly Sound; her Burthen appear'd to be Sound, though the Mother had in the Neck of the Womb several Miliary Pustles and Yellow Excrescences, which undoubtedly proceeded from a virulent *Gonorrhoea*,

which her Husband probably had given her above a year before:

Obs. 422. He relates that on the 25th of January, 1686. He happily delivered a Woman of a Male Child, the Child was seized with a great Defluxion on the Head, caused by a great quantity of cold Water which the Priests poured on the Mould in baptizing him. This cold Water created so great an Obstruction, that it could not breath through the Nose, and therefore was incapable of Sucking, and obliged to quit the Breast, as soon as it had taken it into its Mouth, and this killed the Child in four days after.

Obs. 692. He tells us a Woman Miscarried of a *Fetus* wholly Emaciated, which was about the length of a Man's Finger, being about three Months gone, and this was occasioned by a great clap of Thunder which surprized her.

Obs. 688. This Author mentions a Woman who was delivered at Nine Months end of a Girl very Sound and Well, though the Mother voided near a Quart of Water in one Day, above two Months before, and after voided a considerable quantity more at different times. He makes a question whether these Waters were the effect of a Dropsie, or were really the Child's Waters, and concludes they could not be any other than a Dropsie, because the Child had been incapable of sustaining such a loss, and the Woman must of necessity have been delivered when the first Waters came away.

Obs. 489. He tells us he had laid a Woman of 35 years of Age, whose Hymen was entire, and only perforated with a small Hole, she was with Child though her Husband could never break that Membrane, and enter her Body, as she her self assured him. This Example makes it evident, that a Woman may become big with Child without introducing the Yard, and that it is sufficient that the Seed be lodged within the Neck of the Womb.

Obs. 393. He Remarks, that a Woman of sixteen years of Age and a half was got with Child though she never had had her Courses.

Obs. 20. He tells us that a Woman having had a continual Oppression in the time of her going with Child, was bled four or five

times in the Arm, twice in the Foot, once in the Throat, notwithstanding which she was delivered of a Healthy Child at her due time.

Obs. 30. He tells us that a Woman of eighteen years of Age, was happily delivered at her due time of her first Child who was very well, as the Mother her self was, tho' she had been bled ninety times during her going with Child, particularly in her eighth Month 22 times in the Arm, and twice in the Foot.

Obs. 23. He tells us that a Woman of 22 years of Age, and seven Months gone with Child, underwent a Salivation for the cure of a Pox; the Flux was so Copious, that she filled five or six Basons every Day. This Woman was cured of her Distemper, and at last happily delivered at her due Term of a Healthy, Sound Child, which perhaps would have died of the Pox, if the Woman had not gone through this Course.

Obs. 40. He relates that a Woman having a *Prolapsus* of the Womb made use of a Pessary, who was notwithstanding got with Child, though she did never take that Pessary out.

Obs. 70. He tells us that a Woman who had been Hydropical for the space of nine Years, was notwithstanding Pregnant, and when her time was up, delivered of a lusty Child; the Dropsie encreased till the time of her Delivery, and she had four Children whilst her Distemper was on her, amongst which was a Girl, who appear'd to be seven years of Age, when she was really not above four and a half. After her Delivery, her Belly did not sink more than if a Pullet's Egg had been Excluded, and she appeared as big as if she had near 30 quarts of Water in her Belly.

Obs. 249. He relates that a Woman whose Belly was two Ells of *Paris* measure in Circumference, was notwithstanding got with Child, and delivered several times when her time was up. This Woman in good Health weighed 110 Pound, and when she had her Dropsie, 220, and yet had her Courses very regularly. This Woman made Issues in her Legs, whereby all the Water of her Body being Evacuated, she dyed within a few days after.

Obs. 105. He relates that a little Woman who had had several Children, when she was not with Child would often emit wind with as great a Noise as from the *Anus*, adding, that he had seen several Women, who though with Child, have been subject to the same Accidents.

Obs. 146. He tells us that a Woman at the end of her eighth Month, was delivered of three Children, each of which had a separate Burthen, though the Woman was Paralytick on one side of her Body.

In *Obs.* 174. He relates that a Woman having the *Nympha* excessively long, which was displeasing to her Husband, and incommoded her very much in Riding, but rubbing against each other, she cut them off and lost twelve Porringers of Blood in five or six Hours.

In *Obs.* 223. He mentions a Woman who seeing her Husband, return from the Army, with his Head bound up, was deprived of her Senses by the sudden Fright, fell into a Flooding, and was delivered of a false Conception.

Obs. 245. A Woman about six Months gone with Child being overturned in her Coach, and exceedingly affrighted by the Accident, the Child in her Womb died, and continued there for the space of a Month, notwithstanding which it was not much Corrupted, being preserved by the Waters; for if these had come away, it must of necessity have Putrefied.

Obs. 246. He tells us he had seen an Abortive *Fetus* of five weeks Old, which tho' no longer than his Nail, had all its Parts as perfectly formed, as one of nine Months.

Obs. 251. He Relates, that a young Woman dying after she had been two days in Labour, not being able to be delivered, the Child which was very Large, presenting its Head and one side of its Face, was opened after her Death, and the Child was found Dead; and though its Head was in the Passage, by its struggling it had broke through the Womb, and thrust the Burthen into the Cavity of the lower Belly.

Obs. 301. He mentions a Surgeon who cutting the *Frenum* in a Child that was Tonguetied, opened a Vein which poured out a great quantity of Blood, and this coagulating in the Stomach killed the Infant.

Obs. 315. He assures us he had seen a Woman eight Months and a half gone with Child, who having had a very dangerous Pleurisie about two Months before, was seized with a continual Fever and *Delirium*, of which she died after ten days Illness. As soon as she was Dead, an Incision was made into the Womb, and a Child taken out, which lived about two Hours.

Obs. 342. He mentions a Woman who entirely lost her Senses upon hearing of the Death of her Child, about five or six Days after her Delivery, who notwithstanding became Pregnant, and after was happily delivered of another Child, and restored to the use of her Reason.

Obs. 383. He mentions a Woman of twenty years of Age, who being supposed by the bigness of her Belly to be with Child the first time, and about six Months gone, had violent Vomiting, which after some time were stay'd by the bringing up a Worm as long as a Man's Hand; after this she fell into a Heetick Fever, and continual Loosness, with which being very much wasted she died. Upon opening the Body, the left Testicle was bigger than a Man's Head, and filled the whole Capacity of the lower Belly, weighing fifteen Pound, and was of a very compact Substance; the right Testicle was as big as both a Man's Fists, containing in the midst of it a Glairy Matter, resembling the white of an Egg. The Womb itself was no bigger than that of a Child of eight years Old.

Bartholine and *Forestus* assure us, that a Woman with Child having the Small-Pox, was after delivered of a Child who had Scars, from whence it is evident that the Mother and the Child had the Distemper both at the same time.

Amatus Lusitanus, *Centur.* 5. tells us that a Woman with Child having taken an Infusion of *Saffron*, was after delivered of two Girls, whose whole Bodies were tinged Yellow. This Accident gave occasion to some *Virtuosi*, to make the Experiment in a Bitch, whose Whelps become all Yellow.

In the *Miscellanea Curiosa*, *Obs.* 42. there is a Relation of a Woman in *Hungary* who being in Labour, and the *Fetus* having his Head out, drew it back into the Womb, where it continued a Fortnight longer, and

and after was born without any ill Accident.

Mr. Boyle in his Experimental Philosophy, relates that a Child was heard to cry in his Mother's Belly.

In the *Scholion* to the 62 *Obs.* of the *Miscell. Curiosa*, we are told that in the Year 1624. a Woman nine Months gone with Child, heard her Child sigh in her Belly whilst she was in the Town-Church at Colberg, several Women besides heard it. After this Child was born, its Mother and it self were both poisoned by a certain Perton, her Husband died of the Plague, the House in which she lived was fired, and a great part of the Family Burnt, and others lost their Limbs, and not long after a terrible War broke out in that Country, all which Mischiefs the People did believe, this Child's sighing did Prefage.

Pliny in the third Book of his *Natural History*, Chap. 3. relates that a Child being half born, retired back into his Mother's Womb. This Prodigy hapned the same year that Hannibal destroyed the City of Saguntum.

Of the Cæsarean Birth.

THIS Operation is an Incision into the Belly and Womb, to take out the Fœtus.

THE CAUSE of this Operation is the largeness of the Fœtus, which cannot pass by the Natural and Ordinary Way, or perhaps its breaking through the Womb, and so falling into the Belly, or the Womb insinuating it self through the Rings of the Abdominal Muscles.

THE SIGNS. The largeness of a Child is

easily known, by the Mother's Belly being excessively Swelled. This may be farther convinced if putting your Hand up into the Womb, you find there is an *Hydrocephalus*. You may conclude, the Womb has thrust it self through the Rings of the Muscles, if it be not in its proper place; and you may believe the Child has forced its way into the Cavity of the Belly, if there be nothing in the Womb, and you have certain indications of the Woman's being with Child.

The OPERATION.

Place the Woman on her Back, and then make a Longitudinal Incision below the Navel, the Body of the Womb, and put the *Linea Alba*, and cut through the Teguments till you lay the Womb bare; be sure to make the Incision large enough to extract the Fœtus, and when this is done make an Incision through the Body, and on one side the Womb put the fore-finger of the left Hand into the Incision to widen it, and guide the Point of the Scissars or Knife on the Finger, to prevent hurting the Child; then open the Membranes which contain the Fœtus, and bring both it and the Burthen away, after having dextrously disengaged it. Wipe the Blood off the Wound with a Sponge dip'd in Wine warmed, and make a Suture of the Belly, as in its proper place was directed, without stitching the Womb at all.

THE DRESSING is the same as in the *Gastroraphia*. Put a Pessary into the *Vagina*, for the more easie evacuating the Blood and Cleansings, and making Injections into the Womb.

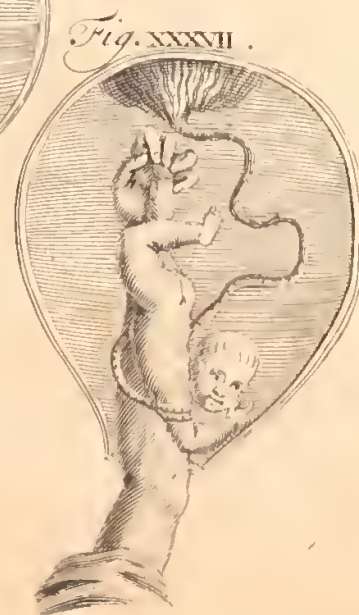
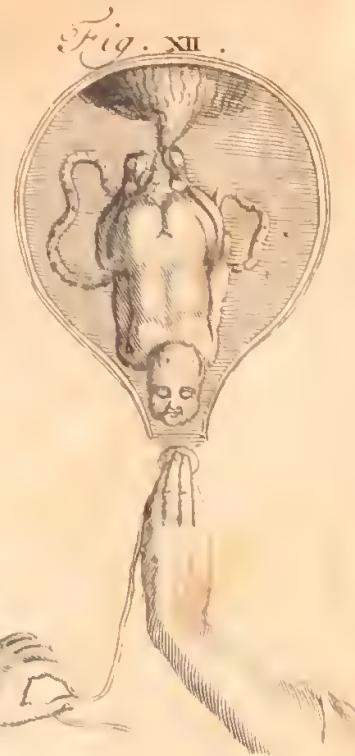
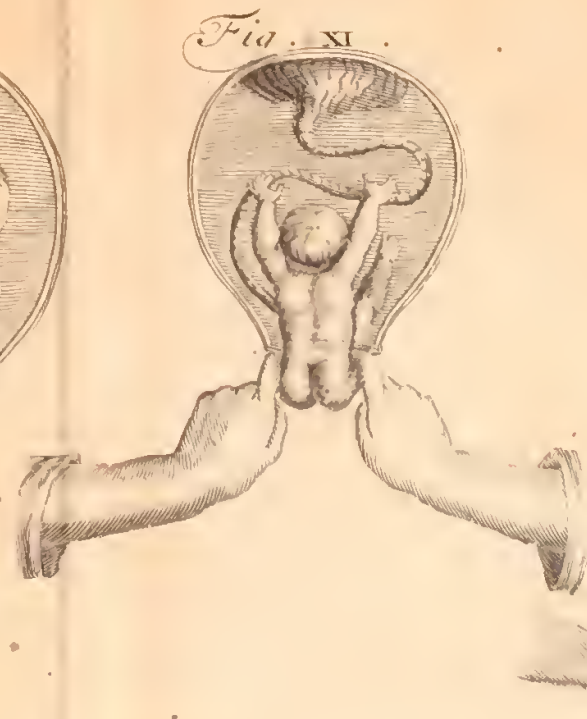
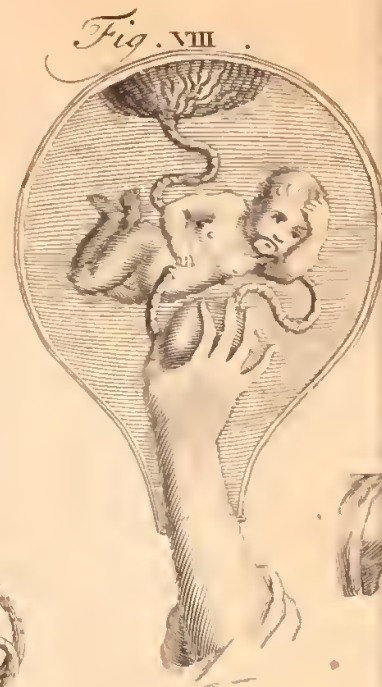
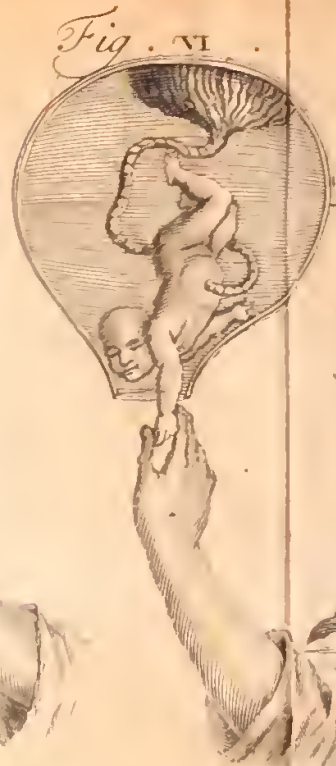
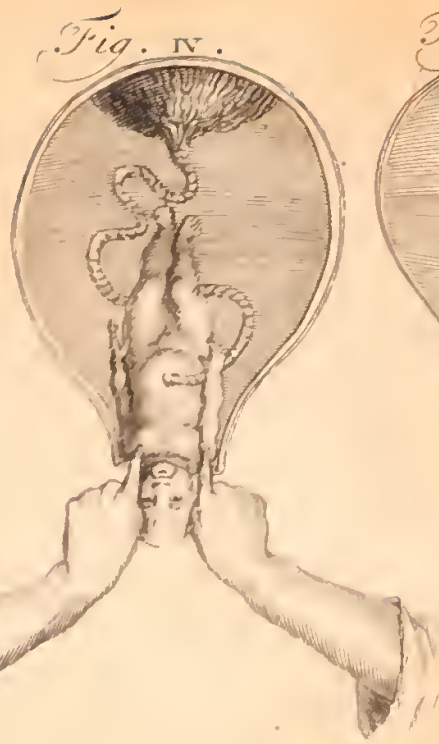
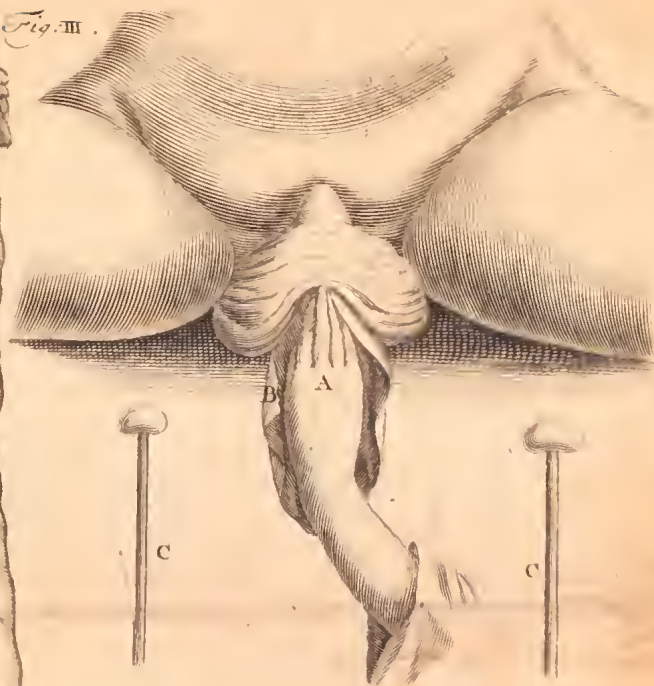
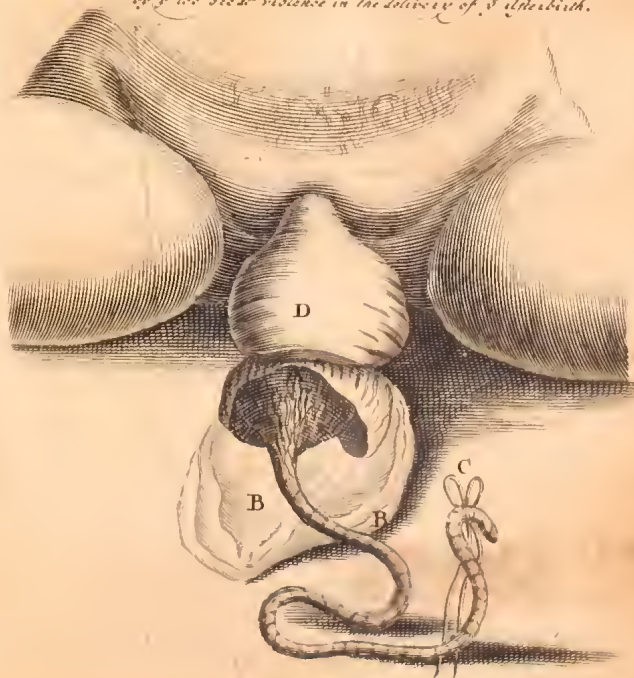
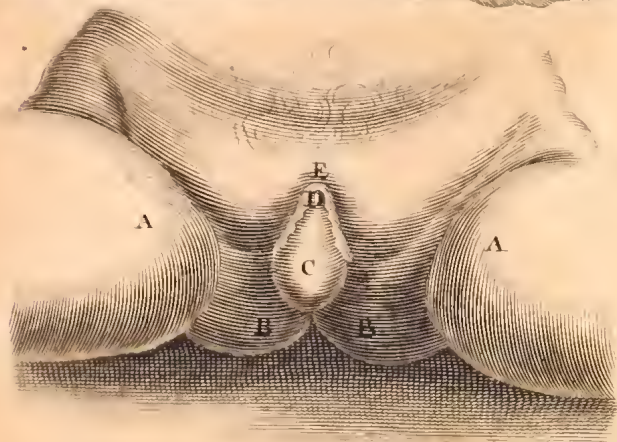


Fig. III.



Ch. 30. Fig. II. Represents the turning of the Womb inside out by the great violence in the delivery of it after birth.



Ch. 30. Fig. I. Represents the descent of the Womb called it Prolapsion.



EXPLICATION of Figures. Taken from Mr. Viardel, Chirurgion to the late French Queen.

Fig. I. **T**HE Manner of feeling for the Child when it lies ready for the Birth in a natural Situation:

Fig. IV. Of widening the Passages with both Hands, to make room for the Shoulders of the Child when the Hand is born.

Fig. VI. Of the Delivery when the Arm presents first.

Fig. VII. To turn the Child when the Belly lies to the Birth.

Fig. VIII. A Woman delivered of a Mole, and a Child afterwards.

Fig. XI. A Delivery where the Buttocks present first.

Fig. XII. Of a Delivery where the Face comes first into the Neck of the Womb.

Fig. XVII. A Delivery of Twins.

Fig. XIX. A Delivery where the Knees present first.

Fig. XXVIII. The Manner of taking a Child out of the Womb when delivered by the Feet.

Fig. XXIX. The Way of delivering the After-birth when the Child is born; as also how to tie the Navel-string.

Fig. XXXII. How to deliver the Head when the Body is separated from it.

Fig. XXXVII. Of a Delivery made when the Neck comes first into the Birth.

Fig. XXXVIII. To deliver the Child when the Hips lie in the Passage of the Womb.

C H. A P. XXX.

Fig. I. Represents the Descent of the Womb, called the Precipitation.

A. A. The Thighs spread.

B. B. The two Branchings of the Seat.

C. The Body of the Womb, that issues out of the external Orifice.

D. The external Orifice.

E. The uppermost Part.

F. Several Pessaries of different Sizes for different Persons.

Fig. II. Represents the turning of the Womb inside out by too great a Violence in the Delivery of the After-birth.

A. The After-birth sticking to the Bottom of the Womb.

B. B. The two Membranes thereof.

C. The Ligature or Navel-string.

D. The Body of the Womb inverted.

Fig. III. Of the Falling down of the Womb, and the Manner of reducing it.

A. The Hand that reduces the Matrix.

B. A Linen Cloth put upon the Fingers to thrust it up.

C. C. Two Box Sticks, made with round Heads to push up the Womb, when the Hand is too large, or the Neck of the Womb too strait.

Of the Diseases and their Cures, that are more peculiar to the Privy-Parts, as well as the parts of Generation in both Sexes; especially of the Fistula in Ano, with the Case of the present French King: Taken from Mr. Monnier's Treatise of the Fistula, and dedicated to Monsieur Fælix, first Chirurgion to that King; the rest from Michaelis, Ettmuller, St. Hilaire, Dionis, &c. Together with two Remarkable Cases of the Bubonocèle from Mr. John Proctor, Surgeon at Carlisle in Cumberland.

Of the Bubonocèle. From Mr. Dionis and Mr. Proctor.

THE *Bubonocèle* is a Tumour in the Groin, which has the Figure of a *Bubo*, and comes in the same place where they do; its name is derived from *Vourvon*, which signifies Groin and *Kele* descent, so that this Tumour resembles a *Bubo*, and is really a Rupture. The Surgeon must not be deceived in the Judgment which he is to make of these Tumours, for if he should mistake a *Bubonocèle* for a *Bubo*, and expecting to find it charg'd with Matter should open it, he would kill the Patient; wherefore he must examine the Indisposition, observing that a *Bubo* comes by slow Degrees, and a *Bubonocèle* all at once, and also informing himself whether the Patient has a Rupture, and whether he has not some way strained himself. If he attentively remarks the Accidents which accompany these Infirmities, he will find that the *Bubonocèle* is accompanied with violent Pains, with Vomings, which do not cease as long as the Tumour continues, and also that what the Patient brings up, has the smell of Feculent Matter, which does not happen in case of a *Bubo*.

The World has given the name of *Misere* to these sorts of Infirmities, when in

the Paroxysm or Fit, because the Patients are then real Objects of Pity, and move Compassion; they require a very speedy Help, which we apply our selves to Procure, by endeavouring to force back into the Belly the part which is fallen out, and which occasions this Tumour. To compass which, we must try to reduce it, as we do other *Hernia's*, which if we cannot do, the Patient must be placed with his Head downwards; and pushing back the Tumour, with more address than Violence, we must force it in again. Sometimes this Tumour has been reduced by throwing cold Water on it; but it belongs to the Surgeon to put in practice all means possible to attain that end, and if all his Pains prove ineffectual, he must make use of the following Cataplasim, made of Marsh-mallows, with their Roots, Melilot, Camomile, Fenugreek Roots, boiled to a Poulitise, with Hog's-grease, Fresh-Butter, or Oil of Lilies; This Cataplasim, composed of emollient Herbs must be made very Greasy, that it may the better Mollify and Relax; it must be spread very Thick, and left 12 Hours on the Part, taking it off, and substituting a fresh one, the Surgeon must again try to reduce the part which frequently

Quently succeeds after the use of these *Cataplasms* without being obliged to come to Operation. If within the compass of two or three days we cannot reduce this Rupture, if the Pain and Vomitings augment rather than diminish, the Surgeon is to advertise or ware the Patient of the danger which threatens him, and propose the Operation to him as the sole way of saving his Life; he must also taking apart his Relations, shew them the danger in which he is, in order to their advising him to settle his Affairs in the World. When a Surgeon has without hesitation acquainted the Patient that he must of necessity resolve to die, or undergo the Operation, there are none but will chuse the last.

Having fix'd the time, and prepar'd the Apparatus, we move the Patient to the edge of the Bed, on the side on which the Tumour is, and place a Cushion under his Buttocks, the Surgeon kneeling by the Bed, and having placed a Servant at his Right, and another on his Left, he begins the Operation, by taking the upper Skin off the Tumour, which he pinches and causes to be held by a Servant in order to cut it, with the *strait Incision Knife*; he makes an Incision two Inches long, then separating the Lips of the Wound he tears the Membranes which envelope the Tumour, while his two assistants separate the Lips of the Wound. After having lacerated or dissected these Membranes, we discover the Purse which contains the Intestine, we open it gently, and with great Circumspection; the Surgeon must not be surpriz'd, if after having a little open'd it, he sees a sort of Serous Humour issue out, this Purse almost always has it. I have observed such a great Quantity, that this Water sometimes flew up to the Bed's-Header; when the Liquor is come out he introduces a hollow Probe, in the Aperture which has made him a Passage, and with his Scissars, one branch of which is guided in the Chanel of the Probe, he opens the Purse its whole Length, and then sees the Intestine discover'd. He draws out as much again of the Gut as is enter'd in the Bag, that the Matter of which it is full, being contained in a larger Space, may facilitate the Introduction of that Entrail. He then takes the same Probe, which he intro-

duces into the Ring of the Muscles, thro' which the Intestine came out, and raising it up, so that the Entrail be not clogg'd he slides the point of his Curve Incision Knife, into the Chanel of the Probe, and raising the Knife at the same time, that he withdraws it, he cuts the edges of the last Ring, which is that which occasioned the Suffocation: In making this Incision on it, he will hear a Noise, as though he was cutting of Parchment. The Wound being clear'd of the Probe and Incision Knife, he feels with his Finger to examine whither the passage be Free, and well clear'd of its Bridle, then pushing in the Intestine by little and little, he continues till he has restored it into the Cavity of the Belly, observing to thrust that in first which came out last; then he tells the Patient, he must move a little towards the Right and Left, that by this Motion, the Intestines may each of them resume the ordinary Place.

If no more than the Gut be in their Tumour, the Operation is finished when that part is reduced; but if the *Epiploon* or *Caul* come out with it, it cannot accompany it in its return to its Place; for if the Air come but for never so short a space of time to the *Epiploon* it Putrifies, and that part of it so corrupted must be cut off, to which purpose the Surgeon takes a Needle threaded, and with it binds that part of the *Epiploon*, which was in the Tumour; and after having fastened and knotted it, he runs the Needle thro' the *Epiploon*, so bound, that the Thread may not slip, then with the Scissars he cuts off the *Epiploon* below the Ligature, and thrusts back that part which is Bound; that is, the sound Part into the *Abdomen* with the utmost Diligence. The Surgeon must observe two things in the Ligature of the *Caul*; First that in performing it, he draw forth a sufficient part of that *Reticulum*, to perform it on a part not yet corrupted by the Air; and secondly, that the ligature being made, an end of the Thread, about a foot long, be left to hang out of the Wound, in order to draw out the Knot, when Nature shall have separated it.

All the Operations practised on the *Bubonocoele* are not so easy as that which I have been describing. That Infirmity is frequently attended with Circumstances which ren-

der it very difficult. Adhesion is one of the most Troubleſome and Painful. There is one Misfortune to be feared in this Operation, which is, that frequently by the Patient's ſtaying too long we find the Inteſtine Gangren'd and Putrefy'd, ſo that it tears like wet Paper; this commonly happens to people of Quality, who long defer their Choice, by reaſon of the great number of Perſons depending on them, who all propoſe their Remedies, which they will try before they ſubmit to Operation, which by this delay become uſeleſs, and that the Surgeon ought to know by the redneſs or lividneſs of the Tumour, by the Diminution of the Patient's Strength, by Augmentation of the Symptoms, and by the long date of the Infirmary. In this deplorable caſe the Surgeon muſt not undertake the Operation, ſince all hopes of cure are paſt.

The Inteſtine and *Epiploon* being return'd into the *Abdomen*, the Patient no longer feels any Pain, eaſe ſucceeds the Complaints, which we heard him before Utter, and in a moment he taſtes the Fruit of the Operation. But before dreſſing him, two particulars are requiſite to be obſerved, in order to render the Operation perfectly Compleat. Firſt to cut all the Membranes which compos'd the Purſe or Bag; and Secondly, that if the Rupture was fallen from the *Groin* into the *Scrotum*, that part muſt be laid open, its whole Length, to prevent a Purſe growing at its Bottom, to receive the Matter in time of Suppuration.

All theſe Circumſtances obſerved the Operation is finiſhed, and the Wound is to be immediately dreſs'd. The Surgeon then begins with his Tent, which for the firſt time, as well as the Pledgets, muſt be cover'd with Yelks of Eggs, mingled with Oil. This Tent then muſt be thus capp'd, faſtened to a String, and be large enough to occupy the Aperture of the Rings, and to oblige us to force it in; he then with two ſmall Pledgets fills up the remaining Parts of the Inciſion, and covers it with flat Pledgets, he lays on a Plaiſter, and over that a Bolſter, which muſt be Thick, the better to contain the Part. He then Embrocates the Belly, and Purſe of the Teſticles, with Oil of Roſes; he applies a ſquare Bolſter to the Belly, and a long one ſerves for a Truſs to

the *Scrotum*. Theſe Bolſters muſt be moiſten'd in warm Wine, and a Band, muſt be provided to keep them all on; the Band muſt be *Inguinal*, reſembling the form of a Spike, and its Circumvolutions muſt be made around the Body and Thigh, the Band re-aſcending betwixt the Thigh, and the Purſes of the Teſticles, like the *Herniary* Bandage, and alſo form a Croſs on the *Groin*, and every time that it paſſes, muſt be faſtn'd with a Pin to render it the firmer.

Though the Operation be well perform'd, and conſequently the Vomitings ſhould end, they yet frequently continue ſome Days. But the Surgeon ought not to be ſurpriſed though that happen, becauſe the Periſtaltick Motion of the Guts tending to preſs downwards what is contain'd in them, when the Parts are in their Natural State, take a contrary courſe during their Suffocation; when the paſſage being ſtopped, the contained *Fæculencies* are forced upwards by an Antiperiſtaltick Motion, which continues ſome days after the Operation, the Guts not having yet re-aſſumed their Spring and Natural Contractions. Some Operators make their Patients ſwallow leaden Bullets, but that practice is Dangerous, and 'tis much better to give them ſome Laxative *Piſſans* to turn out this Excrementitious Matter, by the way which it ought to paſs. The next day after the Operation, in dreſſing the Patient we don't take out the Tent, but if it come out of it ſelf put it in again: When 'tis well placed in the Rings, we leave it for two or three Days, and make uſe of a ſtrong Diſſeſſive, to avoid the Putrefaction of the Parts, to which they are but too Subject; we alſo pour on the Wound ſome drops of *Fioravanti's* Baſam to enliven it, and take care to put in a Tent large enough to occupy the whole Paſſages, this we don't diminish, otherwiſe than in proportion that the Fleſh returning denies it entrance in ſo large a Bulk. To conclude, the Inciſion being cured and cicatrized, we oblige the Patient to wear a great Bolſter and Bandage for the ſpace of two or three Months, for fear that by ſome freſh Strain, the Inteſtine ſhould again ſlip to the place from whence it had been driven, which has ſometimes happen'd, for want of Precaution. The advantage reſulting from this Operation, is that when

when it is well performed, and the Patient well cured on one Side, and is out of fear of any descent on that Side, because the cicatrizing of all the Parts, retains the Guts and *Epiploon* in their Places. It may indeed happen on the other Side, and there are instances of Persons who have been obliged to undergo the Operation on each side at different times.

After having instructed you in the ways of curing these Accidents which fall on Men, 'tis proper to speak of those to which Women are liable, in order to afford them the help which they don't less want than Men in these cruel Infirmities. Women are not indeed afflicted with so many Species of *Hernia's* as Men, they have no other than those we strictly and properly call *Hernia's*; I mean those which are produced by the Parts, as the *Enterocoele*, the *Epiplocele*, and the *Enterocyplocele* being destitute of those which happen from a settlement of Humours, and are *Hernia's* only in Appearance, that Sex not having any *Scrotum*, which is the place where these Infirmities Grow; and for the same reason their *Hernia's* are almost always Imperfect, the parts being more frequently obliged to stop in the Groin, because they don't find such a Purse as the *Scrotum* to slide into.

Women have at their *Matrix* two Ligaments which are call'd Round, from their Figure, and Inferior, from their Situation; they proceed from the lateral Parts of the Fund of the *Uterus*, one on each Side, and in their descent they pass through the Rings of the three Muscles of the *Abdomen*, then dilating themselves in the shape of a Goose's Foot, they insert themselves into, and lose themselves in the Thighs; the Passage which they make is almost like that of the *Spermatick* Vessels of Men, and 'tis by the same way on occasion of some Strain that the *In-*

testine and *Epiploon* slip out, and produce *Hernia's* in Women, which give us as much trouble to cure as those of Men. To this day all Anatomists have believed that the use of these Ligaments, was to hinder the Fund of the *Matrix* from slipping too high up: But the Bottom and Neck of the *Uterus* being but one Continuity, and the latter being so firmly to the Neighbouring Part, 'tis scarce possible that the former should change its Place. I should think Women very unhappy, if for such an imaginary advantage as that, they should be forced to suffer real Inconveniencies, such as are the Pains occasion'd by these Ligaments during their Pregnancy, and the *Hernia's* to which they are liable; and from which they would be Exempt, if there were no Passage for them. I own they receive another advantage by them; for I affirm that they advance the Fund of the *Matrix* forwards, towards the external Orifice; their structure and the necessity of the *Matrix* advancing to meet the Seed in order to receive it, prove my Assertion.

The *Hernia's* which Women labour under, commonly remain in the Groin, sometimes they descend to one of the Lips of the external Orifice, being always caused by Strains, as are those of Men; they are also cured by the same Remedies and Bandage, except only that the *Steel Bandage* or Truss is not proper for them, and that we make use of the *Inguinal* or *Mushroom Bandage*. When 'tis attended with a Suffocation, we have recourse to the Operation practised on the *Bubonocoele*, which in the Sex is not accompanied with such grievous Accidents as in Men; but Women are also more subject to them, because the way through which the round Ligaments pass, is straiter than the Passage which gives issue to the *Spermatick* Vessels of Men.

An extraordinary Case of a Bubonocoele, together with another rare Case of an Umbilical Abscess; Communicated by Mr. Procter, Surgeon at Carlisle in Cumberland.

ROBERT DOBINSON of *Aglionby* in the County of *Cumberland*, Aged 65 Years, having labour'd under a *Bubonocoele* for the space of 20 Years, which by reason of its largeness and extraordinary Weight he was obliged to support with a Band or Truss, contrived by an ingenious Person near *Kendal* in *Westmorland*; on the latter end of *July 1709*, being engaged to go some Miles from home to fetch Coals, and having neglected to put on the said Truss, by violent straining the *Hernia* fell down that Night very Large and Ponderous, and altho' he continued his former Method of Reduction, which had always prov'd Successful, yet at this time it was of no Effect; for soon after his fruitless endeavours to reduce the same, and other Methods used by ingenious Neighbours to no purpose, he was seized with a violent Inflammation, Tension and Swelling of the adjacent Parts, attended with a burning Fever, &c. which caused him to cry out Night and Day, and at length form'd an Abscess upon the left Groin, extending it self over the *Abdomen*, being attended with Heat, Inflammation, Tension, &c. which by no means could be eased, but continued for 3 Weeks or longer: At last it Apothemated, and there appear'd seven large and wide Orifices, out of which daily issued a Fetid, and purulent Sanies, and the *Excreta* seemed to flow out at one of the largest Orifices, his Body remaining bound for the space of 14 Days, as I was Inform'd. They expecting every day his Departure, and giving over all hopes of his Recovery; at last by the advice of *J. B.* a Neighbour, he was prevail'd upon to send for me, after much Entreaty, not believing

the Case so dangerous as it afterward appear'd. However, when I came to examine the Patient, finding seven large Orifices, and upon search the Probe tinctor'd with the *Excreta*, his Strength Wasted, and his Body extremely Emaciated; observing these dismal Circumstances, I gave my Opinion, that the Guts were penetrated, and how difficult it would be to heal such penetrating Fistulous Ulcers, because we cannot apply Topicks to induce Consolidation. The *Viscera* being Thin and Membranous, and having but little Blood which is the *Medium* of Union, and such like Ulcers being apt to creep between the Transverse and oblique Muscles, which are very numerous in those Parts.

These things being laid before his fore-mentioned friendly Neighbour, who out of pure Charity sent for me, and not being willing to leave the poor Man in so deplorable a Condition, he entreated me to do all that was in my Power to assist him, and he would himself dress him every Day, which accordingly he did: And observed in the first place, that his Body was Bound, therefore he order'd him to eat some emollient Herbs, and likewise Groat Pottage, or Water Gruel, and coming to dress him, he took notice that the Groats or Husks thereof lodg'd about the Ulcers, with the stalks of the forementioned Herbs, and that other Edibles were discharged that way; particularly that which confirm'd his Opinion most was, that some Neighbours coming to visit this poor Patient, gave him a few Cherries to refresh and cool his parch'd Stomach; and that the Cherry-stones after a little time were discharged at the said Orifices. My Friend.

Friend no longer retaining his Incredulity, that the *Viscera* were penetrated, immediately sent for me again, the Patient's Wife and other People about him informing me that there was a piece of Pudding Skin, to use their own Expression, about half a finger's length, lying at the Mouth of the largest Orifice, which they endeavouring to cleanse of the *Sordes*, they pull'd out the said piece of Membranous Gut, and then concluded all endeavours were in Vain. But we being willing to use the utmost means possible resolved to proceed, especially since we had met with some Encouragement, by what I had order'd him, which with the blessing of Almighty God had freed him from his Fever, parching Heat, Thirst, Inflammation, Tension, &c.

Yet after all this, I was at a loss to make him evacuate as Nature Required, for altho' I order'd such powerful expulsive Carminative Clysters to be injected daily, and especially such as are chiefly us'd in our Hospitals, and aboard Her Majesty's Fleet, wherein I had the Honour to Serve, yet they were generally discharged at the Orifices, and little or none at all by the *Anus*. I then thought of performing the *Gastrostomy*, but considering the discharge of so large a piece of Gut, which since the case happen'd I am inform'd was larger than described, the Patient being given up for a dead Person; but reflecting again on his great Weakness, and other Melancholy Symptoms, with the advice of his friendly Neighbour I omitted it, concluding that if he died, which was most likely, the World wou'd have said the Operation had hasten'd it. Therefore I dress'd with our Ballam Zenodoct, mixed with Traumaticks, and endeavoured to heal the Ulcer with all Expedition, but alas, to no purpose, for in spite of all we could do, he constantly discharged the *Excreta* by the Ulcers, and none at all by the *Anus*. Here was no room left with the famous *M. Bellosse*, for seldom Dressing, for that which encreased my Trouble, and the Patient's more; was, that although the former Clyster

yet I could not cause any to return the same way it was Injected, but Malgre all endeavours for the space of a Month, or longer, it constantly flow'd thro' the Ulcers; and what added more to my Trouble was, that although I kept the Patient to a moderate opening Diet, and that sparingly; yet as soon as the *Viscera* were fill'd with the *Excreta* the Patient was in extraordinary Pain, which could by no means be allayed or eased, though I exhibited Anodynes and Opiate Mixtures, still he discharged himself by the foresaid Ulcers; as I had often observed when I came to dress him; he desiring me to give him leave to discharge the *Excreta* that way, or else, as he express'd it, would fill all the Dressings and torment him: Things being in this Condition, and my fears encreasing by reason the external Ulcers began to Incarn, and yet notwithstanding he discharged as much *Excreta* at the Ulcers as formerly; being therefore willing to leave nothing undone, I order'd Cordial Juleps, Anodynes, Analepticks, &c. and to the former Clyster added Balsamicks diluted with Traumatick Decoctions: Therefore I gave twice a day my Analeptick Tincture, the use whereof I approved in Spain, in internal Wounds, Ulcers, &c. at the Siege of *Barcelona*: I also order'd some of it to be injected with the Clyster, which by the blessing of God restored the *Viscera* to their wonted Tone of discharging the *Excreta* as Nature Required, and about ten days after I found the *Viscera* restored, and such good effects follow that I healed the external Ulcers; so that in a little time the Patient went abroad into the Fields to bind after the Shearers Reap'd Harvest, Thrashed and performed all the parts of Husbandry, and is still a living Monument of God's Mercy, whereof there are several Witnesses to attest it, and that without the least appearance of a *Rupture*, although the cure was perform'd near four years ago.

June 23,
1712.

J. PROCTER.

Another extraordinary Case by the same Author, J. P.

A Person aged nigh 50 Years, in the County aforeſaid, who had laboured under a *Boil* or *Brooke*, as they term it, that form'd a large Abſceſs upon the middle part of the Umbilical Region, about an Inch below the Navel, as I remember: The Relations of the Patient endeavour'd for 3 Months together to break this *Boil*, but all in Vain; at length they forc'd it with hot *Cataplaſms*, and got ſome Neighbour to open the ſame expecting a great diſcharge from it, and thinking to heal it up again, but could not; upon which they apply'd to an ingenious Lady, their Neighbour, for help; and their fears increaſing by a Conſumption of Strength, and all the parts of the Body and Ulcer inſtead of Healing, diſcharg'd every day more and more. At length they ſent for me; when I view'd the Parts, and obſerved the Patient's Linen, it was Wet, from the Region of the Navel, and upwards, quite to the Skirt, and likewise his Breſt all over Wet, the Oriſce being only as large as to receive a Walnut. I demanded when they dreſs'd him, he being in Bed; they told me that he was ſhifted ſince the Meſſenger came for me, and all the Wet I ſaw was in the time of riding 3 Miles. I could hardly apprehend how ſo ſmall an Ulcer ſhould diſcharge ſo great a quantity of *Ichor*, but viewing it a little more narrowly I obſerved a vaſt quantity of a chylous like ſubſtance iſſued out with a ſort of

buſbling Noiſe; and the greateſt part of his Breakfaſt, with the Food he had moſt lately Eat, came that way. I then examined the Part with my Probe, and found it diſcharged an Alimentary chylous Maſs, in ſuch quantities that it followed my Probe extremely faſt, ſo that I could plainly diſcover 'twas Penetrating: However, the Friends not doubting but I could cure him ſince I had cured their Neighbour *Dobinſon* aforementi- oned, would engage me to undertake him; I aſſured them of the difficulty as well as danger, and difference in this Caſe, between Ulcers of this Part, and others of Parts that were leſs Noble, and of much leſs importance to the immediate ſubſiſtence of Life, and the Nutrition of the whole Body; and I likewise informed them of his great Weakneſs, he then not being able to turn himſelf in Bed without help. Therefore without more ado, I gave him my Analeptick Tincture thrice a day mixed with Balfamicks, and treated the other part of the Cure, as I had done the forementioned Caſe, ſo that in about 14 days ſpace the diſcharge of the Ulcer leſſen'd and abated, and ſpeedily after he was reſtored to his former Health, only that this laſt Winter he had a violent fit of the Cholick, which made an *Inflammation* in the Part, but with a ſlight Compreſs of Linen and ſome proper Anticholicks he ſoon Recovered.

Of Reducing the Fundament and Womb, and opening parts Imperforate, as the Vulva, Penis or Fundament, &c. From M. Vaugion.

THE firſt of theſe Operations is the Reduction of the Gut, into its Natural Place, when it is fallen out. The

falling out of the Rectum proceeds from ſtraining in going to Stool, from a *Paralyſis* of the Muſcular Fibres of the *Sphincter*, or a Re-

a Relaxation of them by a constant Refluxion of Humidities, or some vehement Cough, long Loosness, Dysentery or the Piles, any of which are sufficient to produce this Effect. This Disease is visible enough, part of the Gut hanging out of the *Anus*. If it be of long standing, the Reduction is very difficult and dangerous, and there being most commonly a large Tumour, the Gut is Inflamed and Gangrenous. If it proceeds from a *Paralysis* of the *Sphincter*, the Disease is very hard to Cure, and whatever pains you take to replace it, it notwithstanding soon falls out again; but when it is recent, or in young Persons of a good habit of Body, it may be remedied without any great Difficulty.

To reduce the *Fundament*, place the Patient on his Belly, with his head Low, and his hips Raised, and having dip'd your Fingers in Oil of *Roses*, gently thrust in the Roll formed by the Extravasation of the Rugous Membrane of the Rectum, or take a Compress dip'd in warm Milk, and with this thrust the Fundament up. Foment the part well, and apply Astringents to it, keeping them on with the double Truss, or the Roller with four Tails, suspended with a Coller; the way of making which Bandage is described at large, in the Operation of cutting for the Stone, and the *Fistula in Ano*.

Let the Patient lie on his Belly for several days together, that so the Gut may have time to recover it's Strength, and rub the part well with Oil of *Beetles*. This Oil is made by the infusion of *Beetles*, in Oil of *Turpentine* expos'd to the Sun for a considerable time: Oil of *Turpentine* will do. If the Belly be Bound give Clysters frequently, or let the Patient take an Ounce of Oil of sweet *Almonds*, with a Dram of Cream of *Tartar*. If the Pain be very troublesome foment the part with a Decoction of Cowslip and Camomile Flowers in Milk. Fumigations of *Frankincense* and *Mastick* are good, in short, to prevent the Fundament from falling out again use all sorts of Astringent Remedies.

To reduce the Womb when fallen out, is to restore the Neck of it, to its Natural Place: The Relaxation of the Neck of the Womb after the Delivery, sometimes proceeds from the Unskilfulness of the Mid-

wife in drawing too violently its *Ruge*, and tearing it from the parts to which it adheres, and sometimes it rises from the Natural Laxity of the Part. The abundance of Humours which flow thither sometimes causes this falling out of the Womb, as it is commonly but improperly called, since it never is the Body of the Womb, which comes forth, but the *Vagina* only. The falling out or Relaxation of the *Vagina* may be perceived without any great Difficulty; there appears a Thick, Hard, round Substance, not unlike a Gut, which hangs between a Woman's Legs, and has a Roll at bottom, with a hole in the midst, which is commonly mistaken for the inner Orifice of the Womb. A simple Relaxation of the Neck of the Womb is not dangerous, if there be no Inflammation, Ulcer, or Gangrene. When the Disease is Recent, there is no great difficulty in curing it, but if it be of long standing it is incurable. If it proceed from an internal Cause, and the Relaxation encrease by degrees, the Distemper is curable, but if the falling out of the Womb proceed from some external Cause, as the straining of a Woman in labour, or the Midwife's forcibly drawing out the *Ruge*, there is but little probability of Success.

For the restoring the *Vagina* to its proper Place, let the Patient lie on her Back, with her Hips raised, and the Artist having first moisten'd his Fingers with Oil of *Roses*, may then gently thrust it into its Natural Place. If the *Vagina* be very much Tumefied, and cannot re-enter he must by no means handle it Roughly, for fear of an Inflammation or Gangrene, but he must humect and foment it with emollient Decoctions, and forbear reducing it till the swelling be dispersed. If there be a Mortification already on the *Vagina*, it must be speedily cut off, which is the only means he can have recourse to, to save the Patient's Life. For the doing this, let him make a Ligature on the sound Part, and cut off that which is Corrupted; and if there be a *Cancer* draw the *Vagina* to him, and extirpate that by the Roots, stopping the Blood with good *Strychns*.

The Dressing consists in introducing a Pessary into the Neck of the Womb, which is to be done in this Manner: Take a good thick Bit of Cork, and cut it into the Shape
of

of a Cylinder of two Inches or more in Diameter, in Proportion to the Largeness of the *Vagina*. This must not be round, but of any multangular Figure, with a Hole in it, to give Passage to the *Menses*. If any fleshy Excrescences grow in the Neck of the Womb, cut them off. If there be any *Venerereal Ulcers*, dry them up with Lime Water, mix'd with Spirit of Wine camphorated, four Ounces; *Olibanum* in Powder, one Ounce; burnt Allum, a Dram; Sugar of Lead, half a Dram; dissolve all these together, and apply them hot.

The following History made a mighty Noise some time since both at *Paris* and *Tholouse*: A certain young Woman at *Tholouse* had a Relaxation of the *Vagina* resembling a Man's Yard; and some pretend she abused it that way, it being six Inches in Length, and four in Circumference in the Middle, where it was very hard. This Falling out of the *Vagina* gradually increased from her Childhood. She was teach'd by the Physicians of *Tholouse*, who gave their Opinion, that this Falling out of the Womb was a real Yard; and upon this Determination, the Magistrates of the Town order'd her to go in Man's Habit. In this Equipage she came to *Paris*, where she got Money by shewing her self; till, upon Assurance that she was a Woman, and a Promise of being cured, she was brought into the *Hotel Dieu*, where the Decent was soon put up, and she was forced to resume her Female Dress, to her great Regret.

Of opening Parts imperforate.

The Way is to make an Orifice with an Instrument in Parts where the natural ones are deficient. The Occasion is a Deficiency in Nature, when Children are born with their Ears, Nose, Mouth, Privities, Yard, or Fundament, closed with a Membrane, which is a Continuation of the Skin, or some fungous or scirrhus Excrescence. These Defects are visible upon Inspection, and the Child which is so imperforate cannot breath through its Mouth or Nose, or void its Excrements by its Fundament. If the Auditory Passage be stop'd by a thick Membrane, the Child will remain deaf all its Life-time, unless this Impediment be early removed.

If the *Rectum* in Girls open into the Privities, this is incurable, and the Excrements will be voided that Way.

The *Fœtus* naturally has a Membrane which covers the Drum of the Ear; and if this Membrane be very thick, and Nature of its own accord does not resolve it, you must pierce it with a Lancet, otherwise the Party will be deprived of Hearing. When the Child's Nostrils are closed by a Membrane, it must be cut in the Midst lengthways. Sometimes Children's Nostrils adhere together after the *Small-Pox*, in which Case they may be separated with a *Spatula*; but if they adhere too firmly, or are stop'd by some Carnosity, the Lancet must be used.

Sometimes the *Urethra* is closed by a Membrane, which hinders the Child from making Water. In this Case, an Incision must be made with a strong Lancet directly down, for fear of wounding the *Glans*. If the *Glans* happen to be closed at its Extremity, and perforated under the *Penis* in the *Urethra*, open its Extremity with a Lancet, and introduce a leaden Pipe to pass through, and scarify the præternatural Aperture, and cicatrize it; then bind up the Yard with a narrow Fillet, leaving the Child to piss through the Pipe. If the *Urethra* was stop'd through its whole Length, you might pierce it with a Bodkin, and then put a leaden Pipe in, till the Duct were closed; for without this, the Sides would grow together, and the Passage be stop'd as before.

If the *Anus* be closed by a Membrane, you may make an Incision lengthways with a Lancet; but if it be stop'd by a carnos Excrescence, you must pierce the Flesh till the *Meconium* appear; but this is dangerous, and very often the Child dies in the Operation. If only the Entry of the *Vagina* be closed by a Membrane, you may divide it with a Lancet; but if the Sides of the *Vagina* adhere together, you must place the Patient on her Back, with her Knees raised, and her Thighs spread, and so make an Incision with a crooked Knife, beginning above, and ending below, with the Back of the Instrument turned towards the *Nympha*; and in this Manner you may proceed to act, till the *Vagina* be open'd.

The Dressing consists in introducing Tents armed with good Digestives into the Wound,

of there be any fungous or carnous Excrefcencies, which may require a Suppuration to confume them. If there be no neceffity of procuring a Digestion, introduce *Can-nula's* or Pipes of Lead, proportioned to the largeness of the Incision, to hinder the Parts from adhering together; and for the making these Pipes more easy, let 'em be well smeared with Oil of *Roses*. When there is a necessity of making a large Wound, as there is in cases of Excrefcences and *Fungus*, let the Patient be prepared by Bleeding, Clysters, and other proper Medicines before the Operation, and after it is performed let him be confined to a regular Diet.

Van Horn tells us, he had seen a Child whose *Yard* was perforated near the *Scrotum* and the *Urethra* quite closed up, who had

an artificial *Urethra* made in this manner. The Surgeon first made an Incision the whole length of the *Yard*, then he puts in a leaden Pipe, and stich'd the Flesh on it, and after the Wound was cicatrized there remain'd Callous Channells, thro' which the Child's Urine pass'd.

Some years since in the *Hotel Dieu* at *Paris* there was a Child who had no *Urethra*, and its two *Testicles* were contained each in a separate *Scrotum*. The *Yard* had a slit between the two *Testes* which resembled the Privities of a Woman, which made most, though untruly, mistake this Child for an Hermaphrodite; for the Probe when it was put into the Slit, pass'd into the Bladder, and it appear'd upon Dissection, that he had not any of the Female Organs of Generation.

Of CASTRATION.

THIS Operation is an *Amputation* of the *Testicle*.

THE CAUSE. Divers causes may happen where all other Methods will be ineffectual: As for instance, when the *Testicle* adheres firmly to the Gut, and cannot be separated without loss of Substance: When in great Contusions the *Vessels* and *Vesicula* are crushed, and the influx of the Blood is intercepted: When there is a Varicose Swelling which cannot be dissolved by the usual Applications, or lastly when the Part is infected with some Excrefcences of long standing.

The Excrefcences are sometimes in the substance of the *Testicle*, and sometimes on its Membranes only; and seem to be form'd out of the more Oily and Viscid Part of the Blood, imported by the *Spermatick* Arteries, which escaping through the Porosities of the *Vessels*, is harden'd and condensed by the heat of the Part: This extravasated Matter being lodg'd in the small Tubes, grows Acrimonious, corrodes, huffs up, and distends them, and so produces Fungous and Cancrous Swellings.

When the external Membranes are affected, they communicate the Cancrosity to the Productions of the *Peritonæum*, and sometimes it extends to the Parts contain'd

within the Cavity of the Belly: But in this case the Operation is useless, since not being confined to the *Tunica Vaginalis*, you must destroy the *Vessels*, Rings, and other Parts contained in the *Hypogastrium*, to extirpate it.

Whatever is apt to cause Obstructions, may create an Inflammation in this Part: Thus Seed infected with the Pocky Malignity, sometimes ferments and tumefies the *Testicles*.

If a compleat *Hernia*, made by the Descent of the Gut, happen when there is any Ulcer or Carnosity in the *Testicle*, the Sanious Matter issuing from them, excoriates the Gut, and glews it so firmly to the *Testicle*, that it is impossible to separate them without taking off the latter. Contusions proceed from some external Cause, such as Blows, Falls or Crushes, which Accidents breaks the *Vessels*, and the Blood and Humours stagnating in the Parts create Tumours, Abscesses and Ulcers.

THE SIGNS of an Adhæssion of the *Testicle* to the Gut, is manifest to the Naked Eye, when part of its Substance is destroyed, and taken off to free the Gut, and make the Operation in a perfect *Hernia*. The Sign which without opening the *Scrotum*, demonstrates the adhæssion of the *Testicle* to

the Gut, is that the Gut has remained for some time in the *Scrotum* without re-entring the Belly, which yet is not very certain. You may conclude the Testicle is Bruised, if the Patient feel a violent Pain, and after some blow or crush it Swells. Excrescences are discerned by their Bigness, Weight and Hardness.

Swellings of the Testicles are to be feared, because Abscesses and Schirrosities frequently follow, if resolvents have been omitted in the beginning. Inflammations of the Testicles are dangerous, because they usually terminate in Abscesses, and sometimes Gangrene.

There remain frequently Schirrous Swellings after Contusions, which incommode the Patient all his Life, and sometimes the Testicle Mortifies. If the Swelling be Hard, Schirrous, Painful, and Inflamed, or be of long standing, and both Testicles are affected, the Operation will be dangerous.

The OPERATION.

Place the Patient on his Back, with his Buttocks raised higher than his Head, and his Legs straddling, which must be held by two Servants.

Pinch up the Skin of the *Scrotum*, and let a Servant hold it at one end, and your self at the other, make an Incision lengthways, (or without pinching the Skin, let the Incision be made on the Body of the Testicle) then free the Carnosity from the *Dartos*, which invests the Testicle without hurting the Cover of the Spermatick Vessels, and make a Ligature betwixt the Rings and the Swelling. Cut about a finger's breadth below the Ligature, and take off the Testicle with the *Sarcoma*, leaving the end of the Thread hanging out of the Wound, without drawing down or compressing the Spermatick Vessels, lest you throw the Patient into a Convulsion.

If the Cancrosity spread it self on the Productions of the *Peritonaeum*, consume the superfluous Flesh by Causticks, or wast it with strong Suppuratives before you proceed to the Operation. When the proud Flesh is removed, and the Escar separated, make a

Ligature on the Spermatick Vessels near the Rings of the Muscles, and so take off the Testicle. If the Ligature be made before the separation of the Escar, the Patient will be Convulsed. If the Carnous Excrescence be moveable, and does not adhere to the Testicle, free it and choose rather to leave some little part of this Excrescence remaining on the body of the Testicle than endanger hurting it. If any Vessels appear, make the Ligature before you cut the Excrescence off.

THE DRESSING. Fill the Wound with Dossils armed with a good Digestive, Embrocate with Anodynes, apply Compresses dip'd in Defensative Liquors, as *Oxyerate* or *red Wine* very Hot, and lastly keep the Applications on with the Bag-Truss described in the *Hydrocele*.

THE CURE. Digest the Wound for some time with *Turpentine*, and the *Yelks of Eggs*, to procure a good *Cicatrix*, and consume the remains of the superfluous Flesh. If you perceive any Inflammation, have recourse to Bleeding, and Clysters. Be sure to keep the Wound Clean, and when you obtain a laudable *Pus* begin to Cicatrize; the Patient must abstain from all things Salt, Acid, or Sharp.

R E M A R K S.

Riverius relates an Observation of a Man, who upon a fall from a Horse crush'd his Testicles, which tumefied to that degree, the *Scrotum* was as big as a Mans Head. The Swelling suppurated Plentifully, and there came forth Stones as hard as Flints. The Patient had a Fever and Thirst, which encreas'd continually, Pustules broke out over all his Body, and his Strength decayed by degrees till he died.

Kerkringius assures us, he had seen a young Man who had no Testicles in the *Scrotum*, his Voice was very Musical, and charmed even the most insensible of the Pleasures of Musick. He happened to have a Fever about 18 Years of Age, felt a violent Pain in the *Scrotum*, and found two great Testicles fall into them, upon which he lost his fine Voice, which became like that of other Men.

Of the PHYMOSIS.

THIS Operation is an *Incision of the Prepuce, to give way for denuding the Glans.*

THE CAUSE which makes this Incision necessary, is a contraction of the Prepuce, which strongly compresses the *Glans* of the Yard, which except it be disengaged, becomes Inflamed and Mortifies.

This Imprisonment of the *Glans* is sometimes Natural, and proceeds from its being wrap'd in the Prepuce, and not from it by any Venereal Exercise or Handling. When this Disease is Natural, the Prepuce forms several Wrinkles, between which a Tenacious Slimy Matter is lodged, which arises from the *Glans*, and glews the Prepuce very strictly to it, scarce leaving a Passage for the Urine. Sometimes this Disease is Accidental, and proceeds from some Inflammation, Cancer, Wart, Schirrosity, or Unskilful use of Corrosive Medicines; but whatever the Cause be, the free Circulation of the Blood is interrupted, the Part exceedingly inflamed, and the Fibres of the Prepuce very stiff and stubborn.

The vehement Pain proceeds from the thinness and exquisite sense of the Membrane of the *Glans*, which is composed of, and interwoven with a multitude of Nerves; which Structure renders it very sensible, when it is molested by any Pungent or Corrosive Matter.

THE SIGNS. This Disease is evident, the Patient finds great Difficulty in making Urine, has violent Pains, cannot uncover the *Glans*, and most commonly a Matter like Plaster is lodged between it and the Prepuce.

The OPERATION.

This must not be undertaken, till all other Remedies have been tryed, such as Bleeding, warm Baths, Digestives mixed lightly with some preparation of *Mercury* (and introduced between the Prepuce and the *Glans* with the end of the Probe) *Galen's* Cerate, emollient Injections, a small Ball of Lint insinuated in between the *Glans* and the Skin, Compresses dip'd in *Oxyerate*, &c.

Observe here in all Diseases of the Yard, (and so in the use of these Medicines) it is very Commodious to lay it on the Belly, and keep it Suspended in this Posture by a small Bandage, the Description of which the Reader may find in its proper Place.

If the Prepuce be firmly united to the *Glans*, which is known by the Skin not being brought over, and the Probe passing between it and the *Glans*, the Operation will be Dangerous, and cannot be done without disengaging the Prepuce from the *Glans*, and creating a great deal of Pain, and endangering a Mortification of the Yard.

When you judge the Case will admit of Operation, let the Patient stand or sit as you like best. Draw the Extremity of the Prepuce as far back as you can, and command an Assistant to keep the Skin down at the Root of the Yard, (that the Incision may reach exactly to the bottom of the *Glans*) then introduce a small Incision-knife, with a button of Wax on its point (to prevent wounding the Part) under the Prepuce, and cut thro' it. If one Incision be not sufficient, make another on the opposite Side.

THE DRESSING. Lay on the Wound a small Pledgit arm'd with some good Balsam, and over this a Compress in form of a Cross, perforated in the midst of the Passage of the Urine; and keep these on with a narrow Fillet near three quarters of an Inch Broad. This Fillet must be of a sufficient length to cover the whole Yard by its Circumvolutions, have a hole made at one end, and the other end slit lengthways above an inch and a half. In applying this, pass the two Tails or Slit end through the hole at the other end, then draw it as strait as is Convenient; make several Circumvolutions spirally, till the whole Yard be cover'd, and the Fillet spent, and then fasten it by the two Tails.

If you judge it necessary to cover the Pledgit with an Emplaster, make this of the same Figure, and let it be perforated in the midst like the Compress.

For the Patient's ease, and to prevent the Inflammation of the Part, make a Linen Case

of an equal length with the Yard, and large enough to contain it with all its Dressings: Let this Case have a Perforation at the end for the Passage for the Urine, stitch two small Straps at the lower end on each Side, and on the Upper, which may be long enough to be fastned to the Band which goes round the Waist to suspend the Yard, and prevent Pain and Inflammation.

This case is of singular use to prevent painful Erection in Priapisms, Virulent Gonorrhæas, Heats of Urine, and other Diseases incident to this Part.

THE CURE do's not differ from the usual Method, in all simple Wounds. For instance, if any Inflammation arise, have recourse to Bleeding, cooling Clysters, and a regular Diet, and when the Wound is incarned, Cicatrize it.

R E M A R K S.

Fabricius Hildannus, Cent. 4. Obs. 8. Relates

the History of a young Man 22 Years of Age, who from his Infancy had a Prepuce of a monstrous Size, contorted before in such a manner, that in the emission of his Urine the stream was diverted on one side, and wetted his Cloaths. The Prepuce was not Membranous, as it ordinarily is, but a Carnous Substance, and when he made Water, a great part of the Urine was detain'd by it; to prevent which, he was oblig'd to draw the *Glans* out with his Fingers. This constant handling made the Yard swell prodigiously, and the inferior part commonly call'd the Suture, was exceeding Tense and Horney. The Author cut off this Prepuce close to the *Glans*, and the Patient was happily cured of this Inconvenience. Before the Operation he had used all kinds of General Remedies, and now after it he applyed Restraining Powders to stop the Blood, and in order to keep the Yard streight, put a Pipe into the *Urethra*.

Of the PARAPHYMOSIS.

THIS Operation is the *Reducing the Prepuce over the Glans, when it is so far Retracted, that it cannot cover it without the help of Manual Operation.*

THE CAUSES. The Strangulation of the *Glans* is caus'd sometimes by a simple Retraction of the Skin, which forms a Roll round the Yard, and at other times by an Inflammation of the Prepuce, from some preceding Cancer or Tumour. The Yard is often exceedingly swoln, and there are two or three Rolls one over another, which mightily intercept the Refluent Blood. When this happens, it is almost ever attended with a swelling in the lower part of the Prepuce, filled with a reddish Water, rarified and converted into a windy Matter by the heat of the Part.

THE SIGNS of a *Paraphymosis* are a Tumour of the Yard and Rolls on the Prepuce. There is sometime an observable swelling under the Prepuce, filled with a reddish Water, which rises to such a height, that except you Sacrifice deeply the tumefied place, to

give a discharge to the Part, the Yard necessarily Mortifies.

The OPERATION.

To reduce the *Prepuce*, you must use both forefingers and both middle fingers. Place these beneath the Rolls, formed by the tumefied Prepuce, and with the two Thumbs compress the sides of the *Glans*, to lessen its Bulk, and so draw on the *Prepuce*. You must not thrust back the end of the *Glans*, to make the *Prepuce* come over it; because it enlarges it self, which hinders Reduction. If the Inflammation be very great, and renders this Method Impracticable, apply Compresses dip'd in *M. Lemeris*, or some other Styptick Water, and when that is abated, proceed as before.

THE DRESSING is the same with that used in the *Phymosis*.

THE CURE. While the Disease remains, the Method of Cure does not differ from that of the *Phymosis*.

Fabri-

Fabricius Hildanus informs us, he cured a *Paraphymosis* in very Plethorick Gentlemen by the following Method. In the first place, to keep the Patient's Body Cool, he enjoyned him to shun all manner of strong Drink, purged him with Cholagogues, and bled him copiously in the Arm; then he applied a cooling Liniment twice a Day to the Region of the Kidneys, and the following Cataplasms as often to the suffering Part. *R. Barley Flower* ʒiv. *Powder of Roses* ʒij. *Pomegranate Flowers*, and *Cypress Nuts* xi. *Poil the Ingredients in Rose and Plantane Water. Make a Cataplasme with these, with the Addition of Yolks of Eggs, which is to be repeated twice a Day.*

These Applications being continued for several Days, the Pain abated very much. But a great erection happening one Night, obstructed the Cure, and the Prepuce violently compressing the Glans, all the Symptoms encreased. Upon this he ordered him to forbear all Commerce with his Wife, not permitting him so much as to see her, purged him with Cholagogues, using outwardly the following Liniment. *R. Oil of Violets, Nutsfar and Roses*, à ʒi. *Oil of Henbane by expression*, ʒij. *Camphire dissolved in Vinegar of Roses*, ʒi. *Mix these in a Mortar.* Besides this he gave him a Dose of *Laudanum* after Supper, after which he had better Repose than ordinarily, and the Erection was less troublesome. He persisted to give him *Laudanum*, which seldom exceeded two

Grains, and outwardly to use the Liniment above described, and continue Cataplasms to the Part. The Swelling of the Yard abated soon, the Patient was cured, and had several Children after. But we must not omit here his caution to young Practitioners not to use the Cataplasme above mentioned, if the *Paraphymosis* proceed from impure Embraces, lest the Malignity of the Distemper be repelled, and ill conditioned Ulcers ensue.

REMARKS.

Fabricius Hildanus, Cent. 3. Obs. 88. Tells us, a certain Smith of 40 years of Age, of a Melancholick Habit, had a small Wart on the extremity of his Prepuce, of the bigness of a Vetch. This Man being Married, found a great and continual Pain in this Excrescence upon the Embraces of his Wife, which obliged him to forbear knowing her for thirteen Years. The Pain increased by little and little, and at last degenerated into a horrible Cancer, as big as an Infant's Head. The whole Yard became a huge deformed Mass of Flesh, with several Ulcers on its Surface, through which the Patient discharged his Urine: The noisom scent of this Cancer was so great, that no one could endure to come near it. The Author made an Amputation of the Yard, and cured him perfectly.

Of LITHOTOMY or cutting for the Stone.

THIS Operation is *Incision made in the Perinæum, to extract the Stone through the Aperture.*

There is no Animal, except Man alone, infested with this Disease.

THE CAUSE. The Ancients did believe the Stone to be formed by the more Viscid and Fæulent Parts of the Blood passing off with the Urine, and settling in the Bladder. *Hippocrates* is persuaded, it proceeds from the more Terrestrial and heavy Parts of the Urine it self, which in too long a Retention of it, subside and sink to the bottom of the Bladder, like Sand in a Vessel of Wa-

ter, and are there bound together by a thick slimy Matter, which compacted Mass, in process of Time encreases by the supply of new Materials. *Fernelius* conceives all Stones are first formed in the Kidneys, and fall from thence by the Ureters into the Bladder. This Opinion he founds upon an Observation, that he had seen no Person afflicted with the Stone, who had not before felt Nephritick Pains: This he farther confirms, by assuring us, that in most great Stones when broken, there is found a small Kernel in the Center, of the same Colour and Consistence with the Stone, and of a Figure agreeing to the

the Basin of the Kidneys, and inclosed in a Case of a different Colour from it.

* But the Modern Chymists seem to me to frame the most plausible Theory of the Formation of the Stone in Animal Bodies. These Gentlemen in Analysing the Urine by Fire, find in it two constituent Principles, viz. a Urinous Salt of a Volatil and Nitrous Nature, and pure Sulphur not unlike a Vinous Spirit. Now experience shews us, that upon mixing Spirit of Wine and Spirit of Nitre, a *Coagulum* will result in an instant; it is very easy and natural to suppose, that the like Principles existent in the Urine, leaving their Superfluous Phlegm, may unite, precipitate, and produce the like Effect.

Van Helmont does not think the Principles of the Urine alone is sufficient, for the Productions of the Stone; but adds a Petrifick Ferment, which he places in the Kidneys and Urinary Vessels, and reckons up as a third Agent, required to fix and coagulate the former. *There is no Transmutative principle in Nature*, says that Author, *without a Ferment; the Intestine Motion of the Particles of the Urine, is not the immediate Cause of its Corruption; its Putrefaction does not arise from any vicious Disposition of the Urine, but from a peculiar corruptive Ferment residing in the Kidneys, and other Vessels.* This he illustrates by the Similitude of a Vessel, in which any Acid Liquor has stood for some time, which coagulates and sours Milk; by Leaven which ferments Dough, and by the taint of a Mu-

sty Vessel, which alters and corrupts Wine, or any Liquor put into it. This Ferment which for its fineness and subtilty, bears some Analogy to the Odoriferous Steams issuing from scented Bodies, he calls it *Odor* or *Scent*; and of such a Nature he pretends the Ferment is, to whose Petresying Influence, he ascribes the Origin of the Stone; and to confirm the existence of such a Ferment, he alleges this Experiment, that Urine will sooner Putresce in a Vessel tainted with it before, than in another which is Clean and New.

Having laid down the necessity of a peculiar Ferment to perfect this Work, he proceeds to explicate the manner how it is performed. He assures us, he has found in a Spagyricall Examen of the Urine a Nitrous Spirit, which he terms the *Coagulator*, and another Spirit not unlike Spirit of Wine. Besides these, says he, There is in Urine a Terrestrial Styptick Spirit, which by the Assistance of the corruptive Ferment, is volatilized and imbibed by the Urinous Spirit, and these two uniting, excite and put into Motion the Vinous Spirit, which before lay dormant in the Pores of the Urine. At last after some conflict and mutual Action they combine together, Præcipitate and Form a Stone in the midst of the Liquor. From hence he infers, Stones are form'd in an Instant, and grow gradually; though sometimes too he supposes they receive a considerable Addition in a Moment of Time.

Ill Diet conduces much to the Generation of the Stone; for instance, all Spiritous Drinks, Sharp Sauces, Milk-Meats, Fruits, Rye-bread, and the like; the latter upon the account of their Foulness, and the former upon the account of their Spirituous Parts. The one furnishes Materials for the Stone, and the other Petrifick Ferment. Nature too oftentimes as well as Diet, has a share in this matter, and the Stone proceeds from some Petresying Seeds we inherit from our Parents, and keep all our life after.

THE SIGNS. The Stones found in Humane Bodies differ very much, as Small, Great, Smooth, Unequal, Flat, Round, Oval, Square, Hollow, Light, Heavy, Hard or Soft; some have Kernels, others not; some are White, Gray, Red, Black, Brown, or of other Colours; some adhere to the Parts,

* Our Author seems to be mistaken in representing *Helmont's* Opinion of the Generation of the Stone: Spirit of Nitre and Spirit of Wine stir indeed, and that with great Heat and Tumult, but after combine and compose a Temperate Liquor, or Spiritus Nitri dulcis. The true *Helmontian Hypothesis*, is that the Duellach or Animal Stone is formed by a Volatil Salt coagulated by a Vinous Sulphur; which conjecture he forms on the famous Experiment of mixing Spirit of Wine and Spirit of Urine both perfectly dephegm'd. (for the least Aquosity remaining, defeats the Tryal) both which Liquids instantly coagulate into a Hard, Dry Substance, which he calls *Offa Alba*. See *Helmont de Lithiasi*.

Parts, as the Sides, bottom or Neck of the Bladder, others are loose; some are in the Kidneys, *Ureters*, Bladder or *Urethra*; some are included in *Cystis*'s, others not. In short, they are found in all parts of the Body.

If a Stone be lodged in the Kidneys, there is an Inflammation, a violent and fixed Pain, (which encreases if you press the Part with your Hand.) There is a Fever and Suppression of Urine, which distills drop by drop, and sometimes is bloody, which proceeds from the fretting of the Vessels by the growing Stone. Muddy and Purulent Urines, discover the Blood to be Extravasated, and an Abscess in the Kidneys. In this case Vomiting, a Stupor of the Thigh and Leg ensue, and the Patient cannot endure to keep his Body Straight, the Testicle of the same side is retracted into the Groin, and sometimes Pus is Evacuated with the Excrement; for the purulent Matter corroding the Gut, runs through it, and passes off with the *Feces*.

The Communication between the Nerves of the Kidneys and Stomach, and the Agitation of the Spirits in the Carnous Fibres of the Stomach by the Inflammation of the Kidneys, are the causes of the Vomiting.

The Kidney lying on the Head of the Muscle *Psoas*, compresses and inflames it, and this inflamed Muscle presses the great Trunk of the Nerves, (which presses thro' its Substance, and is distributed to the forepart of the Thigh and Hip,) and from hence proceeds the *Stupor*, because the free influx of the Spirits is interrupted. The *Psoas* and Iliac Muscle contiguous to it being inflamed, (which two Muscles are the Benders of the Thigh) they cannot obey or follow the Motion of the Extensors; and this is the reason the Patient cannot keep himself Erect, without enduring vehement Pain. The Iliac Muscle being united to the *Cremaster*, communicates its Inflammation to it, which causing a Contraction of the Fibres of the latter, the Testicle must of necessity ascend to the Groin.

But after all, these Symptoms concurring are not sufficient to give us an absolute assurance there is a Stone in the Kidneys, since they may attend an ordinary Inflammation of that Part, as in the case of Nephritick Cholicks.

We discover that there is a Stone in the

Bladder, by a lively burning Pain in Pissing, and the Urine coming forth by Drops, and after divers intervals, as in the Strangury.

The Stone sometimes stops the Neck of the Bladder, and sometimes wholly blocks it up, according to the several Motions it receives from the Urine; and this is the cause of these Intermissions. When the Bladder is evacuated its sides rub on the Stone, which grates them by its hardness and inequality; and from hence proceed great Pains after Urining, and sometimes drops of Blood. The Patient feels an itching in the *Perinaum*, which is continued to the extremity of the *Glans*, and obliges him to rub it: This sometimes happens from sharpness of Urine. The weight of the Stone is often felt; and the irritation of the Fibres sometimes causes an involuntary Erection of the Yard. The Urine is sometimes White, sometimes Bloody, Thick, Turbid, Muddy, and full of Sand.

When the Urine is very Clear, and there is Sand at the bottom of the Urinal, this is a sign of a Stone in the Bladder. If the Stone extracted be polite and smooth, it is a sign there are more, by rubbing against which this smoothness is caused.

If the Stone be very large, and rests in the Neck of the Bladder, it becomes equally large with its bottom. When it fixes to the bottom of the Bladder, and is contained in a *Cystis*, the Patient may carry it all his Life-time without any notable Inconvenience, or the appearance of any of the signs above Recited.

Among the Diagnostick signs, there is none more certain than the Resistance, of the *Catheter*, and the discernable Noise from gently striking on the Stone.

THE OPERATION.

This must not be undertaken, till you have a very good assurance of the existence of the Stone in the Bladder.

To obtain a certainty of this, introduce your Finger into the *Anus*, and turn it towards the *Pabis*, then bend it, at the same time pressing the bottom of the Belly with your other Hand, and if there be a Stone, you will feel it with your Finger. In Women.

men or grown Maids, you must put the Finger up the *Vagina*, but in young Girls into the *Anus*.

But since hard Swelling and Schirrosities may impose on you in this way of Examen, the *Catheter* is to be relied on as the most certain Evidence.

The first way of Searching.

Let the Patient sit in a Chair with a Back, on which he may rest or lie on his Back. Take the Yard by the *Glans* between the Thumb and Fore-finger, drawing it up Straight, compres the *Glans* a little to open the *Urethra*, into which introduce the *Catheter* with its Concave side downwards; when this is past in far enough for you to judge it is in the Neck of the Bladder, turn it quick and dextrously, and bring your hand over the Patient's Belly, and at the same time that you turn it, draw the Yard a little forward to keep the *Urethra* streight and without Wrinkles, which may hinder the entering of your Instrument.

If after turning the *Catheter* you find it did not enter, leave the Yard, and introduce your Finger into the *Anus*, to guide the end of it into the Bladder. After this draw your Finger out of the *Anus*, and quit the Yard to strike with the Instrument, turning it every way to hear what a noise it makes on the Stone. If it happens that the Stone swims in Urine, (for the Bladder must be full when you pass the Instrument,) and you have reason to think this may hinder you from perceiving it, evacuate the Bladder by drawing out the Silver Wire in the *Catheter*, and after try as before.

Second way of Searching.

The following way seems more convenient, because there is no need of turning the *Catheter*. Let the Patient lie on his Back, and holding the *Glans* between your Fore-finger and Thumb, raise the Yard up, inclining it a little on his Belly, hold the Rings of the Instrument on one side of the Belly, and compres a little the *Glans* between your Fingers to open the *Urethra*; then introduce the end of the *Catheter*, continuing to push it on gently, till it enters

the Bladder. By proceeding this way, you save the trouble of passing your Hand over the Patient's Belly, and turning the Instrument.

The way of Searching Women.

To Search a Woman oblige her to lie on her Back, with her Buttocks a little raised, and her Thighs divaricated; then separate the *Nympha* with the left Hand; and with the Right introduce the Instrument into the Neck of the Bladder, as in Men. When you are well assured there is a Stone, prepare the Patient for the Operation by general Remedies, Bleeding, Clysters, and other proper Medicines, to prevent any ill Habit of Body, having a bad influence on the Wound after the Operation.

The OPERATION.

Place the Patient on a Table of a middle height, with his Back supported on the back of a lin'd Chair, his Thighs open, his Knees drawn up to his Belly, his Heels applyed to his Buttocks, and his Hands resting on each side his Ancles. To keep him in this Posture, take a great Swathe three Inches broad, the middle of which is to be put about his Neck, and with each end of it the Arms are to be fastned to the Thigh and Leg of the same side, each hand resting on the out side of the Ankle of the Foot. This Posture is exceeding convenient to hinder his stirring, to keep the Bladder steddy, and give liberty to the Muscles of the lower Belly to perform their Actions. After this place a Servant on the Table behind the Patient, to keep him down by pressing on his Shoulders, in case he should attempt to rise. All things thus prepared introduce a *Catheter* (not like the former, but with a Hollowness or Furrow along the convex side) into the Bladder, after the manner before described. The *Catheter* thus introduced, must be held by a Servant placed for that purpose on one side of the Patient, who must hold it with both his Hands, drawing up the *Scrotum* in such a manner, that the back of the *Catheter* which thrusts out the *Perinaum*, may be between his two Fore-fingers, and leave space enough for you to make your Incision. The Incision must

must be made with a sharp two edged Knife on one Side the Suture of the *Perinaum*, which must be greater or less, as you judge the Stone to be. To perform this dextrously, hold your Knife like a Lancet, and entering in the most prominent Part, plunge it quite to the *Catheter*, continuing to pass and repass it in the Furrow of that Instrument, till you have laid as much bare as you desire. This Caution is necessary, lest if the Incision were made at several times, there might be more than one Orifice.

In Men the Incision must be near two Inches and an half long, in Children less. It is better to have it too great, than to be obliged to enlarge the Wound with a Dilator, in case the Stone should prove too great to be extracted through the Aperture, because such violent Distention tears and bruises the Fibres of the Bladder. The Incision, if it be well made, must enter the *Urethra*; and you must not draw the *Catheter* out of the Bladder, till you have slip'd into its Furrow a Gorget or two Conductors, on which the *Forceps* is after introduced; for without the Direction of these, you may easily mistake and pass them aside, which too often happens; and whilst the Operator thinks he is in it, and seeking the Stone, feels it with his *Forceps*, instead of that pulls the Bladder and often tears it. When the *Forceps* is in the Bladder, open it, and gently search for the Stone, which (when found) hold fast. You must never close your *Forceps* in the Bladder, except when you have hold of the Stone, for fear of tearing its Membranes. When you would take hold of the Stone, open the *Forceps* with both Hands, and you may be assured you have hold of it, if its two Bows stand wide open.

If the Stone be oval, and you have hold of it lengthways, loose the Stone, and introduce your *Forceps* a second time, and take hold of it another Way. But observe here, the Wideness of the Bows alone is not a sufficient Evidence to assure you that you hold the Stone lengthways, since the same Appearance will be if the Stone be large; wherefore, to obtain a more full Information of this Matter, inquire of the Patient how long he has been afflicted with this Distemper, (for the older the Stone is, the thicker it

grows) or if he feels a great Weight in his Bladder. You may farther judge of the Thickness of the Stone, and perhaps of its Figure too, by introducing the Finger into the *Anus*, and feeling it through the Gut. When you have hold of the Stone with your *Forceps*, do not draw it directly out, but turn your Fist to the Right and to the Left.

If the Stone happen to adhere to the Bladder, you must not obstinately resolve to extract it, lest you tear the Membranes; but if it be fixed to the Neck of the Bladder, it will be freed without Suppuration. You may conclude that it is fixed to the Bladder, if not being very big, it comes forth with Difficulty, and then you must proceed gently in extracting it.

If Stones are excessively large, as some noted in our Remarks, forbear extracting them, lest the Patient expire in your Hands. If you perceive the Stone is broken in extracting it, put in the *Forceps* again, and draw out the Fragments in the same Manner as the whole, and bring out the clotted Blood with the Spoon. If the Patient be very weak, remove him to his Bed, and put a Tent into the Wound, to prevent it from closing, and draw out the remaining Fragments after he has recruited his Strength.

If the Stone be so big that it cannot pass through the Orifice, dilate the Wound.

This Operation is called the Greater *Apparatus*, or Cutting on the Staff.

The Lesser Apparatus in Men, or Cutting on the Gripe.

This Manner of Operation is called Lesser, because it does not require so many Instruments as the former. To perform this, put your Forefinger into the *Anus*, to bring the Stone to the *Perinaum*; make your Incision on the Stone it self on one Side of the Suture, and extract it through the Aperture with a Hook. This Operation takes place when the Stone is not too big, and you can bring it to the *Perinaum* with your Finger.

The Way of Cutting Women.

Put your Forefinger and middle Finger up the *Vagina*, or into the *Anus* in young Girls; with

with these two Fingers bring the Stone to you, compressing the Bottom of the Belly with the other to make it descend; put a hollow'd Probe or Director up the *Urethra*, which is to be held by some Assistant; then slide a Dilator on its Furrow, and taking out the Director, dilate the *Urethra* without cutting at all, and so extract the Stone with the Hook or *Forceps*. You must not put the Dilator too far up the *Urethra*, because the Neck of the Bladder is short in Women; and by this means you may happen to lacerate the *Sphincter*, and so cause an involuntary Efflux of Urine. This is called the Lesser Apparatus in Women.

The Greater Apparatus in Women.

The Patient being put into and kept in the same Posture with Men described before, introduce the Conductors into the *Urethra*, and between them slide a Dilator; then withdraw the Conductors, and so dilate; next introduce the *Forceps*, and drawing forth the Dilator, take hold of the Stone with it. If the Stone be too big to come forth, make a small Incision to the Right and to the Left, to make way for it. Instead of the Conductors, you may use the Gorget, if you like it better.

The *Urethra* in Women dilates exceedingly, and it seldom happens that we are obliged to have Recourse to Incision. Besides, Women are more rarely attacked with this Distemper than Men; because their *Urethra* is wider, straighter and shorter, and the Urine more easily drives away that Sand which is lodged in the Bladder.

The Success of the Operation may be guessed at from the quiet Repose which the Patient enjoys, the Freedom of Breathing, the Moisture of the Tongue, no immoderate Drowth, Pain scarce sensible, little or no Fever, no Swelling in the Hypogastrick Region, and a Cessation of Inflammation on the fifth or sixth Day.

Sometimes a Stone is voided out of the Bladder, and passes into the *Urethra*, where it lodges, and obstructs the Emission of the Urine. In this Case, if the Stone be near the *Glans*, press that with your Finger, and if it do not easily come forth, bring it out with the Extractor; if both fail, make an

Incision on the Side of the *Urethra* to take it out so.

When the Stone is in the Neck of the Bladder, push it with the *Catheter*, or endeavour to bring it back by slipping the Finger into the *Anus*.

When the Stone is in the *Urethra*, if it be small, stop the Passage with your Fingers, compressing the Yard beyond the Stone; then blow into the *Urethra* to dilate it, and push the Stone forwards with your Fingers, till you have brought it forth. This Way succeeds better in young Children than in Adults, their *Urethra* being more easily distended.

The Stone may sometimes be drawn out by Suction. This succeeded well with Dr. Mays, who advised the Mother to suck the Yard of her Infant.

If a Stone be lodged in the *Urethra*, and cannot be got out by any of the Ways above-mentioned, draw the Skin of the Prepuce upwards, and take the Yard between your Fingers to hold the Stone firm, compressing it a little, and making the Incision on the Stone lengthways on the Side of the Yard. When the Stone lies bare, press it out with your Forefingers, or pick it out with the Extractor.

THE DRESSING. When the Patient is cut, apply a great Compress on the Wound, and let some robust Fellow carry him to his Bed. If there be any Fragments of the Stone remaining in the Bladder, or you have Ground to think there are more Stones, put a Tent dip'd in some Digestives into the Wound, to prevent it from closing; and if there be a Flux of Blood, stop it with Restringents. If there be no Stone or Gravel remaining in the Bladder, put no Tent into the Wound, but a Pledget with some good Balsam, with an Emplaster over that, and a Compress, both in the Form of a Horseshoe. The Dressing must be kept on with a Roller with four Tails, or the double T. suspended with a Collar, and the Legs below the Knee bound together with a narrow Roller, to keep the Wound from gaping.

The Roller with four Tails is made with a Piece of Linen Cloth three Inches broad, and an Ell long; slit this lengthways at both Ends to the Middle, leaving between four and five Inches in the Middle undivided:

vided : Apply the plain or entire Part on the Wound, and then cross the two foremost Tails, and fasten them to the Collar about the Ribs. (This Collar is a Band stitched at both ends, which is put about the Patient's Neck, and hangs down to his Belly.) Then pass the two other Tails thro' the Collar, and bringing them back fasten them behind.

The T T or double T, is a Girth which goes round the Waist, with two Straps in the midst sown at some small distance from each other ; apply the middle of the Girth behind, and tie its ends before, then bring the two Straps between the Legs, crossing them on the Wound, and tie them before to the Girth or Waistband.

The Dressing for the Incision made on the Yard.

Apply a Pledgit dip'd in some good Balsam, and over it an Emplaster. The Bandage and all the rest, is the same as in the *Phymosis*.

THE CURE. We have observed before, that in case there be reason to suspect there is Gravel remaining in the Bladder, you must not instantly heal the Wound, but put a large Tent into it with some good Digestive, to give leave to the Gravel to purge it self through the Orifice. If the Wound be contus'd, you must Suppurate till a laudable Digestion appear, every day lessening the Tent. But if after the Operation there be no Contusion, it suffices to put in a Pledgit arm'd with some good Balsam, and dress it twice every Day, till it be perfectly cured. The Patient must be fed with good Broths and Gellies, and must not eat any thing Solid for fear of a Fever, which would obstruct the Coalition of the Wound.

To prevent the Stone from being reproduced in the Bladder, the following Precautions must be used. The Person who is Cut must lead a regular Life ; that is, He must not eat to Excess, for fear of creating ill Juices, the Stomach not being capable of good Digestion, when it is over-charged with Meat. He must eat Wheaten Bread well Baked, for Rye Bread containing an Acidity, is apt to Coagulate the Humours, and produce the Stone. He must avoid all

salt Meats, all sorts of Ragousts which ordinarily are High Season'd : All these Aliments Heat, and are apt to petresie that Glairy Matter, which is lodged in the Kidneys and Bladder. Milk Meats, Old Cheese, Hard Eggs, Sallets, Unripe Fruits, create ill Humours, which being mixed with Acids, acquire a coagulating Property. The use of Heady Wines and Beer, is dangerous. *Gesner* has observed, that if you put Sand into Stale Beer, it forms a Stone. Muddy Waters, and Waters of melted Snow and Ice are very Impure, and full of Bodies, which have a coagulating Property. Excessive Application of Mind, Debauches of Wine and Women, all violent Passions are very hurtful to Persons who have any Disposition to Gravel ; all Excesses in any of these kinds sharpen the Blood, and waste its Unctuous and Balsamick Part. Too long Repose is Hurtful, because the gross Feculent Matter subsiding, and not being dispersed by Motion is collected together, and soon coagulated by an Acid.

For these Reasons the Patients Diet must consist of such things as are sweet and easy of Digestion, as Veal, Lamb, Fowl, &c. or Broths, in which the cooling Plants are boiled, as *Succory, Sorrel, Parsly, Spinage*, or others of the like Nature.

White-wine boiled with a Moiety of Water, &c. Sleeping and Waking must be Moderate. The Patient must not sleep on his Back, for this posture is Heating. The Body must be kept open with Clysters, if Nature does not act her Part, and gentle Purges given at proper Times, of *Whey, Manna and Cassia*.

Those who are subject to Nephritick Cholics, may be cured by Emollient and Lenitive Clysters made with *Mallows, Marshmallons, Milk, Sugar, and Oil of Sweet Almonds*. These are Preparative to Diureticks, such as Ptisans made with *Salt-Peter* Refined $\frac{3}{4}$. Dissolved in a Decoction of *Rest Harrow, and Dog's Grass*. There is not a more excellent Diuretick than *Turpentine*, $\frac{2}{3}$. made into a Pill. To harden it, it must be boiled in some Diuretick Liquor, as Turnep Water, and so made up. To the part affected, apply Fomentations, &c. *Roots of Marshmallows, 3/4. Mallows, Melilot, Chervil and*

Camomil together three Handfulls, *Linfeeds*, *Parsley Seed*, a vi . Boil the Ingredients together, and apply the Cataplasim to the Part.

Baths made with Emollient Herbs, are very useful in Nephritick Pains, and Broth with Oil of Sweet Almonds, vi . given to the Patient in the Bath. You may likewise give *Turpentine Pills*, or a Dram of the Powder of *A. illepedes*, both which are proper to expel Gravel by Urine.

If in Nephritick cases the Patient Vomits, give him the following Powder. R *Sperma Ceti*, *Crabs Eyes*, ss . *Cinnabar of Animony*, vi . *Volatile Salt of Amber* iv . gr. *Laudagr.* iss . *Trochisc.* *Alkekengi* with *Opium* ss . Mix these for four Doses.

Mr. *Boyl* in Nephritick Pains, commends *Castile Soap dissolved in old Oil of Wallnuts*, adding Oil of *Ginger* three or four Drops. This is a good Diuretick.

R E M A R K S.

There is in the Hospital of *the Charity at Paris*, a Stone weighing 51 Ounces, taken out of the Bladder of a Priest after he was Dead, who had been cut to no purpose, the Stone being too large to be extracted.

There was found in the Bladder of a certain *English Knight*, who died at 82 years of Age, a Stone which weighed 25 Ounces and a half, the Urine had formed a Chanel in it, through which it passed into the *Urethra*. This Chanel had one Hole in the place where the *Ureters* enter the Bladder, and another at the bottom of the Stone.

Hildanus Centur. 1. *Obs.* 69. relates the History of a young Fellow who had omitted by the Yard 300 Stones of different Colours, some as big as Nuts, others as large as Chestnuts. He voided all these in two Years time, with great Pain, accompanied with Blood; This young Man died of the Plague.

The same Author relates, *Cent.* 4. *Obs.* 50. He had found the Bladder of a Man divided into two Bags, each Bag containing six Stones about the bigness of Galls.

In *Centur.* 4. *Obs.* 5. He mentions a Stone which he had taken out of the Bladder of a young Man of 20. Years of Age, which weighed 22 Ounces. It seemed to consist of several small Stones cohering, and had the

Figure of a Cupping-glass. The Patient died in the Hands of the Operator.

In *Centur.* 6. *Obs.* 57. He tells us he had a Stone by him, which he had extracted out of the *Scrotum*, which weighed 8 Drains when it was first taken out, but at present weighs no more than five.

In the *Miscellanea Curiosa*, *Obs.* 44. There is a History of a Man of 64 Years of Age, tormented with a violent Pain in the *Ischium*; He had an *Asthma* to that degree, he could not breath except he kept his Head Erect, had the Jaundice besides, and in fine died of these Distempers. Upon opening the Body, two Tubercles were found in the Lungs, and 72 Stones about the bigness of Peas, of a blackish, yellow Colour in the Gall-Bladder, and *Porus Choledochus*. In the Gall-Bladder of a certain Count of 70 Years of Age were found several Stones, the greatest of which weighed 14 Drains, and the least 4. In a Woman of 63 Years of Age, the Gall-Bladder was filled with several greenish Flints, larger than Beans.

Five Stones, the least of which was as big as a Nut, were taken out of the Gall Bladder of Pope *Urban* the VIII. *Borrichius* tells us, he had found in the Bladder of a Woman, above seventy Stones of an irregular Figure, soft to the touch, which melted in warm Water. *Helmont* relates, that he had found Stones in the Gall-Bladder of several Animals. *Bartholin.* *Cent.* 1. *Hist.* 34. tells us that a certain Person very much subject to Gravel, falling into a prodigious Sweat, evacuated a great quantity of small Sand that way.

In the *Miscellanea Curiosa*, *Obs.* 46. Is an account published, of a certain Ox seeming to be more stupid than any of the Rest, inclining his Head to the Ground, often lying down, and nodding in a Paralytick Manner, who being observed to waste away, was killed by his Owner. The Brain was found petrified; and as hard as Marble, all the remaining part of his Body sound. The Leanness and Decay in this Animal, did doubtless proceed from a Defect in the Distribution of the Spirits from the Brain, to the several parts of the Body.

Obs. 27. Contains the History of a Woman, who for several years being torment-

ed with cruel Nephritick Pains, made Urine so thick that it Roped, and sometimes felt such an extream Chillness, that standing before a violent Fire Naked, she could not perceive the least Heat, though her Skin were Scorched. This Woman dyed with excessive Pain, and her Kidneys were found Petrified, and as solid as Alabaster.

Obs. 65. A certain Person of 72 Years of Age, of a Phlegmatick Habit of Body, was attacked with a Suffocative Catarrh, and a great Suppression of Urine: A large Aperture was made in the Vein of the Arm, out of which six Ounces of Blood were drawn, together with which came out Four small Stones, which made so great a noise in falling into the Porringer, as to be heard by the standers by, these were of a yellow Colour, a little inclining to Red, and of the same bigness with the Gravel usually voided in Urine. The Patient was soon cured of his Catarrh; but the Difficulty of Urine remained, and soon after he died of an Apoplexy.

Obs. 66. Relates the History of a Woman of 33 Years of Age, of a Sanguine Complexion, who being near the time of her Delivery was suffocated with a Catarrh. In the inferior part of the Liver was found a great Abscess or Mass of Matter contained in a

Cystis, so hard and strong, that it could not without great Difficulty be cut with a good Pair of Scissars. This was filled with a Black reddish Substance, very Glutinous, not unlike Birdlime. This Glew was so Tenacious, it was difficult to get it from the Fingers. In the midst of this was lodged a Stone, about the bigness of a Pullets Egg, which being divided in the midst, sparkled as if it had been filled with Nitre. This Stone was much harder on the Surface than within, and void of all perceptible Scent.

Obs. 107. Relates that a Widow of a certain Shoemaker, had for the space of 16 Years, a Stone in the left Kidney, who by the Torment which she suffered, was wasted to that degree, she seemed a living Skeleton. She had a great *Stupor* on her left Thigh. This Woman took every day for some time, a *Decoction of Speedwell* in great Quantity. This innocent Remedy brought the Stone from the Kidneys into the Ureters; whilst it was detained there, she found the Pain intolerable, and expected nothing less than to be killed by it. She continued the use of her Medical Drink in greater Quantity, and so brought it down into the Bladder, and thence by the help of the same Drink and Fomentations, at length brought it quite forth.

Of the PUNCTION of the PERINÆUM.

THIS Operation is an *Aperture made in the Perinæum, to let out the suppress'd Urine.*

THE CAUSE. The Suppression proceeds from some great Inflammation, or some Carinosity, Fungus, Schirrus, or Ulcers, which blocks up the *Urethra*.

THE SIGNS. There is great Pain and Inflammation in the *Perinæum*, the Urine is retained, and the *Catheter* will not pass the Duct to let it out.

The Operation must only be undertaken when milder ways fail, such as Injections, the *Catheter*, or Cataplasms. In this case put the Patient into the same posture as in cutting for the Stone, and without using the *Catheter* (for we suppose that will not en-

ter into the Bladder.) Make an Aperture with a Lancet or an Incision Knife, large enough to put in a *Canula*, whose extremity may pass into the Bladder. This must be left in the Wound for the Urine to pass through, till the Inflammation be over. After the *Canula* is drawn out, dress the Wound.

THE DRESSING. This is exactly the same with that described in cutting for the Stone.

THE CURE of the Inflammation of the *Perinæum*, consists like others of the like kind in applying Discutients to the Part, taking Internally Volatile Medicines, *v. g.* *R. Car-duus Water, ʒi. Water of Elder Flowers, ʒij. Crabs Eyes, ʒi. Diaphoretick Animony, ʒss, Sper-*

m a Ceti, *℞i*. Laudanum gr. 11. Sugar-candy, *℞ij*. of which Mixture the Patient at several Times must take some Spoonfuls.

R E M A R K S.

In the Chamber of the Blessed Queen in the *Hôtel Dieu*, there was a Big-bellied Woman ill of the Small-Pox, her Fundament was rotted from the *Os Pubis*, to the *Os Sacrum*, notwithstanding which, she was delivered of a living Child, who died some Hours after, as did the Mother not long after the Delivery.

Cataplasms are made of Roots of *Asparagus*, *Bryony*, *Hemlock*, Flowers of *Camomil* and *Elder*, with *Camphire* and *Sulphur*. Compresses dip'd in *Spirit of Wine Camphorated*, may be applyed. If these prove ineffectual, suppurate the Wound with emollient Cataplasms made with *Lily Roots*, *Bryony*, *Marshmallows*, *Brank-ursin*, *Pellitory*, *Chervil*, *Mullin*, *Camomil*, *Melilot*, *Figgs*, &c. After the Ingredients are boiled, pound them in a Mortar, adding *Oil of Lilies* or *Roses*, and apply the Cataplasim hot to the Part.

When the Suppuration is over, cleanse the Ulcer with some deterging Balsam. Sweeten the Blood with Volatile Medicines given Internally, such as *Diaphoretick Antimony*, *Crabs Eyes*, *Volatile Salt of Hartshorn* and *Vipers*, and an infinity of others to be found in *M. L'Emery*, or other good Chymists. These Volatiles may be given together, or separately, in some proper Vehicle, as *Carduus Water*, v. g. of the Powder *℥ss*. in a Glass of the aforesaid Water.

If the Ulcer be in the *Urethra*, which may be discovered by the Suppuration, make your Injections of Mundifying Ingredients infused in Hot Wine.

Bartholin. Cent. 2. Hist. 52. tells us that a Man of 49 Years of Age, had a Suppression of Urine caused by Straining in Mounting his Horse, a Fever ensued with a continual Hiccough, a Pain and Swelling in the Groin. Upon insinuating a Pipe into the Bladder he Urined, the Swelling of the Belly sunk, and the Pain was allayed; but the Pain sometime after returning, the Patient died. Upon opening the Body, there appeared two Tubercles of the bigness and figure of the Testicles, which perfectly stop'd the Duct of the *Urethra*. These in all points performed the Office of a Valve, opening from without inwards, if the *Canula* were thrust against them, but stop'd the Passage from within outwards. These Tubercles consisted of a firm white Flesh, without any Purulent Matter; The Right was larger and something more brown than the Left. The lower part of the Bladder was a little Mortified, the Patient made a Purulent Water, and the *Colon* adhered strictly to the *Peritonæum* on the right Side.

Of the FISTULA in ANO.

THIS Operation is an Incision made into the Anus, to lay open an Ulcer in that Part.

THE CAUSE. A Fistula is a Callous, Sinuous, Deep Ulcer, with a streight Mouth or Entry, opening into a more Spacious Bottom. These Cavernous Ulcers full of Partitions, are formed by the sharp and saline Parts of the Blood.

The immediate Causes of *Fistula's* in this Part, are External and Internal. The External are Contusions, Impure Embraces, Falls, Leeches ill applyed, &c. all which

obstruct the Circulation, detain the Humours, and create an Abscess, apt to degenerate and become Fistulous. The Internal Causes are Abscesses, proceeding from Obstructions, Inflammations, Ulcers, Piles, &c. The Anus is more subject to *Fistulas*, than any other part in the whole Body. This proceeds from the great quantity of Fat, with which the *Intestinum Rectum* is loaded, from the Evacuation of the *Feces* here (this being the common Sink, where all the Filth of the Body is brought down to be carryed off) from its continual Humidity, and numerous

merous Vessels, as Branches of the Hypogastrick Arteries and Veins, a Branch of the *Aorta*, another of the inferior Mesenterick Artery, the Hæmorrhoidal Veins, the vast number of Lymphaticks;) and lastly, from its Glands which separate a White, Glairy, viscous Liquor. Some or more of the Causes above-mentioned, hapning to meet with a part thus disposed, it is no wonder to find a *Fistula* soon formed.

Fistulas differ much, and are to be distinguished by the following Remarks.

THE SIGNS. If the *Fistula* be in the fleshy Parts, the *Pus* is White, Turbid and Viscous. If in the Nervous Parts, the Patient has Acute and very sensible Pains, and the Humour is Serous and Sharp. If it attack the Veins and Arteries, it works thro' them by its Acrimony, and the Matter which comes away, resembles the Washings of Flesh. If the *Fistula* emit a Thin, Clear, Sharp Humour, it is a mark it has invaded the Bones, and they are Corrupted. In this last Case Callosity is greater, which proceeds from the Excessive Acrimony and Saline Parts, able to Corrode and Cariate so solid a substance. How the Saline Parts form a Callosity, may be conceived by the like Effect which Salt has, when strewed upon Pork which it hardens, whilst the Humidity of the Flesh dissolving it, its parts like so many Stakes enter and hinder the Motion. This explication is plausible enough, and may be admitted by those who place the Hardness of Bodies in the Repose of their Parts.

Recent *Fistula's* in Persons of a good Habit of Body, are curable if the Part concern'd will admit the Application of proper Remedies. But when Inveterate or in ill Bodies, or invading Parts necessary to support Life, as the Bladder, Guts, &c. where no Application can be made, are desparate.

Fistula's are of different sorts; some pierce the Gut without any outward Orifice. Others open outwardly, without entering the *Intestinum Rectum*. These two Species are termed *Incomplete*. Some open within and without the Body, and these are called *Complete*. There are some which have divers Cancers, all opening into one Cavity.

If the *Fistula* pierces the Gut only, there is a small Tumour and Inflammation Visi-

ble, without the *Pus* flows out of the Gut, there is Pain, Excoriation, Itching, and a *Tenesmus* caused by the Acrimony of the Matter, which irritates the Part, and solicites the Patient to go to Stool without any Necessity. If it open outwardly, the Orifice is discerned by the Eye, and the Probe. No *Pus* comes from the Gut, and none of the preceding Signs appear. The Sinuosities and Cavens are found by the Probe, by the Pain and Matter of various Colour and Condition. From considering the Signs, we proceed to.

The OPERATION.

The Operation is the same, of whatever Nature the *Fistula* be. Place the Patient on the brink of his Bed, with his Thighs straddling; If the *Fistula* open outwardly, enlarge the Orifice to introduce the Incision-Knife with its Probe. This Knife must be crooked and slender, and the Probe Long, pointed at the End, and made of well temper'd Metal, to prevent the danger of its breaking in the Operation. Put the forefinger of the left Hand up the *Anus*, introduce the Knife into the external Orifice of the *Fistula*, and when you feel the Point of the Probe on your Finger, perforate the Gut with it, and then draw one end of the Probe with your Finger, and the other with your Hand, so make the Incision quite thro' at one Slash. Observe before you use this Instrument, to have its Edge cover'd with a fine thin Silver Chape or Sheath, which keeps it from hurting the Patient when it is thrust in, and is to be taken off when the Knife is in the Wound, before the Incision be made.

If the *Fistula* pierce the Gut only, and the Swelling, Pain, Inflammation, or other external Marks of the bottom of the *Fistula*, are very remote from the *Anus*, forbear the use of the Knife, which would make the Wound too Large and Painful, and make the Aperture with potential Cauteries only.

For this purpose lay an Emplaster over the bottom of the *Fistula* of the same length with the Orifice design'd, apply the Caustick bruised on the Part, first wetting a little the Place, then cover it with another Emplaster to keep it on the Part. The lower

perforated Emplaster, prevents the Caustick from acting on the adjacent Parts, or spreading farther than you Design. The time of its lying on, must be proportioned to its Strength. After which the Escar is to be separated with the Lancet, and the Operation performed after the manner above described. When the Operation is over, search with your Fore finger whether there be any Sinus's, which if you find, open the Scissars, and cut the Communications; without which caution the Wound apparently cured, will infallibly Relapse. Here you must be careful of cutting Arteries which may lie in the Way; in case of such Accident, stop the Blood with *Lemery's*, Styptick Water, or some good Restringent Powders, of which you may find an infinity in Authors.

If any Surgeon in the Country shall be called to perform this Operation unprovided with the Instrument described, he may use his Scissars in this manner. Let him take an Iron Wire sharpened at the end, and pass its point through the enlarged Orifice, and thrust it into the Gut, having introduced his Fore-finger into the *Anus*. Then let him draw the point outwards through the *Anus*, and when it is come far enough out, bring the ends of the Wire together, and with the left Hand draw the Flesh to him, enter one Blade of the Scissars or the crooked Knife, and at once cut through all the Flesh. This method is useful in defect of other Conveniencies, or in case the *Fistula* lie so deep in the *Rectum*, you cannot without difficulty introduce the Knife together with its Probe. In this Operation, you must be careful to avoid cutting the Sphincter quite through, lest the Patient ever after suffer an involuntary Emission of the Excrement.

THE DRESSING. Fill the Wound with Dressings arm'd with good Digestives, and so dispos'd, that the Medicines may have their Effects equally on all its Parts, over these

lay Pledgits with more Digestives, and after the Cavity is filled, cover all with an Emplaster, and over this lay a Triangular Compress, which must be of this Figure, that one side may pass between the two Buttocks. The Dressings must be kept on by the Roller with four Tails fastned to the Collar, or with the single or double T. These are the very same with those used in the Operation of cutting for the Stone, where the Reader will find them described, which we shall omit here to avoid unnecessary Repetition.

THE CURE. Good Digestives must be apply'd twice a Day, to remove all Callosities. If these fail of effecting, lay a Caustick on the Indurations, and when the Digestives are laudable, mundifie the Ulcer after the usual Manner.

Fabricius Hildanus, Cent. 5. Obs. 80. Relates a Cure of a *Fistula* arising from the ill managing a Tumour of the Parotid Gland. A certain Person had an Abscess under the right Ear, which by degrees degenerated into a *Fistula*, which had been three Years unsuccessfully in the Hands of some Barbers, till he was called to it. He found it Cavernous with two Sinus's at the least under the Skin; the first of these extended upwards towards the *Cranium*, dividing again into two other; the second went downwards in its Descent, following the Course of the Jugular Vein, all these Cavities were lined with a *Callus*. In the first place he prescribed the Patient an exact order of Living, purg'd him twice, consumed the Skin which covered the *Fistula* with a Caustick, hastning the Separation of the Escar with *Basilicon*. The Callosities in the bottom he likewise consumed with another Caustick, with the Addition of his *Angelick Powder*. After these remov'd, he proceeded to Mundifie the Wound with the same Powder, which he Extolls for its wonderful Efficacy in consuming superfluous Flesh, advancing the growth of the sound, and procuring the Coagulation of Wounds.

Of the Operations to be perform'd on the Anus. From Mr. Dionis, and of cutting for the Fistula in Ano; with the History of that of the French King's, perform'd by M. Fælix, chief Surgeon to his most Christian Majesty.

THE *Anus* is afflicted with as many or more Distempers, than any other part of the Body, by reason that being the Common-shore through which pass all the greatest Impurities, and as it were the Sink of all the Filth of the Kitchen, it must needs be frequently irritated and subjected to Sediments, by reason of the Acrimonious Humours determined to this Part. Some of these Diseases are cured by Remedies which are either general or particular, and others by Manual Operation: Which last are those I now propose to Treat on, and at the same time display the Operations which they Require, which I reduce to Five; the first is that of piercing the *Anus* when clos'd, the second the reducing the Gut when fallen, the third is curing the *Condyloma, Crissa, Rhagades* and *Fundi*, which happen to this Organ, the fourth is the cure of the *Hæmorrhoids* or *Piles*, and the fifth, the opening of a *Fistula* in the *Anus*.

Some Authors tell us, that the Fundament may be two ways clos'd, either naturally, as when a Child comes into the World without any Aperture; or accidentally, when through negligence, the ulcerated edges of that part are left to glue together, and cicatrize. I have seen Children born with their Fundament clos'd, but I never found any who had that part accidentally clos'd, but on the contrary believe it to be impossible, by reason that the great Excrements which daily issue out at it, oblige it to open to make way for them, not allowing a sufficient time to the sides of the Ulcers there form'd to join together: Where-

fore looking on this sort of closure as imaginary, I shall only treat of that which is Natural.

'Tis not generally perceiv'd the first Day of the Child's Birth, that it has this Defect; but the second or third, when it has not found it self, we must examine the Cause of it: The Chirurgeon must remedy it as soon as discover'd, because the Child will be Lost, if we don't provide a speedy issue for its detain'd Excrements: These very Excrements will sometimes facilitate the Operation; for pressing on the Membrane which serves to hinder their coming forth, they discover the Place where the Aperture is to be made. If this Membrane is thin, 'tis easily pierced; but if thick and strong, as I met with it in a Patient, where the Mark of the *Anus* scarcely appear'd, more Pains are requisite to make the necessary Hole there. To this end we may make use of the *Lancet*, or the *Incision-Knife*, thrusting it in 'till we find issue out the *Black Matter* called *Mæconium*, which Infants void immediately after their Birth. This Aperture is to be made by two Incisions, which cross one another, in the place which is to be the middle of the Aperture of the Fundament, which will the more dispose it to take the round Figure of the *Anus*, than if it were perform'd by a single long Incision. After allowing the Child time to Evacuate, we thrust in the *Lint Tent*, charged with the Yolk of an Egg, beat up with a little Oil; the bulk and hardness of the Tent is to be so proportion'd as not to give much Pain, and to leave liberty for the fresh Excrements, to push forth in case there

be any to come out: Then are to be applied the *Pledget*, and the *Plaster*, next to that the *Bolster*, and above that the other *Bolster*, the whole being fasten'd and kept on by the *Band* shap'd like a T.

'Tis needless to make use of a hollow'd Tent, as we do in case of other Apertures, because there is no reason to fear the re-union succeeding. If on the first day we happen not to have made the Aperture large enough, nor of the Figure which it ought to be, it must be amended the next; and to perfect this Operation, with the point of the Incision-Knife, we disengage and unbridle each fold or wrinkle of the Circumference of the *Anus*, cutting the Membrane which causes the closure in the shape of a small Rose, that nothing may remain which may for the future hinder it opening as much as the great Excrements Require, in order to their Passage out, and to shut exactly after their Evacuation.

'Tis needless to prepare the *Apparatus* before the Operation, because in the first place 'twould be to lose those Moments which ought to be employ'd in relieving the suffering Infant, and the Interval which necessarily falls betwixt the Operation and the Dressing, in order to allow the Child time to avoid the *Mæconium* and detain'd Excrements, is sufficient for this Preparation.

This Intestine sometimes falls, and comes out in Children when they are suffer'd to Cry too much, and in adult Persons which may have strain'd themselves on several Occasions: When it turns out like the Finger of a Glove, and comes forth more or less, according as the Strain was: I have seen it come out half a Foot in Length, and as thick as the Arm. This Accident happens to those who have a Stone in the Bladder, by the straining Efforts which they make to Piss; and frequently during the Operation for the Stone, this Intestine not only violently thrusts out the Excrements which it contains, but comes out it self, being stimulated by the Pains which the Patient endures in that Operation, which ought not to hinder the Operator from continuing his Course; for after that the Stone is extracted, he easily restores the Intestine to its Place. The griping Pains caus'd by the *Disentery* frequently force out this Gut, and at other times it is driven out by the grievous Pains

of a hard Labour: To these extraordinary Efforts alledged as the cause of this Indisposition, Authors add the Weakness or Palsy of the Muscles call'd the *Erectors of the Anus*, as also the excessive abundance of Humidities which soak into these Parts.

A Chirurgion cannot mistake this Distemper, since the first glance of the Eye discovers it; wherefore without losing any time in examining the Patient, or the Spectators, from what cause it proceeded, he must prepare himself to reduce it with all Speed, to which purpose he is not to trouble himself to dispose the *Apparatus*, 'till he has restor'd the Gut to its Place. If he can quickly get some hot Wine, with that he is to wash the part of the Gut which is come out with a Linen Cloth or a Sponge, then compressing it gently with his Finger, and thrusting it back he causes it to re-enter, which is sometimes very easily done. Those subject to this falling out, may themselves perform the Reduction, as those which have Descents, often reduce them with less Pain than others do. Some Children by their continual crying render this more difficult, in which case the Chirurgion takes the time when the Intestine contracts it self by a *Vermicular Motion* which is proper to it; for his efforts would be Vain, if he should shove it back at the time when 'tis enlarg'd by its *Peristaltic Motion*.

The greatest difficulty of this Operation is not the returning of this Gut, but the retaining of it in its place when reduced; in order to which, as soon as the Reduction is finished, we lay on the *Anus* a *Bolster* which we cause some Person to hold, whilst we prepare the *Apparatus*, for fear the Intestine should start out in the Interim.

The *Apparatus* consists in only two strong thick *Bolsters*, one of which is a long one, to be plac'd betwixt the two Buttocks, and the other a square one, to be kept on the *Anus* with the *Bandage* like a T Mark'd, whose top is slit into two Parts, in order to pass along the sides of the Parties of the Testicles, and to be fasten'd to the circular Bandage, which surrounds the Body. The *Bolsters* are to be wetted in an *Astringent Wine* prepar'd with *Wormwood*, *Galls*, *Pomegranate-shells*, *Allom*, and the *Green Fruit of Guaiacum*, all boild in red Wine. The Wine must be ready

ready at Hand; for if the Gut falls out again at the moment the Patient goes to Stool, before 'tis reduc'd it must be wash'd with this Wine, which is to be heated every time 'tis us'd. This Remedy is excellent for the Cure of these fallings out of the *Rectum*; for at the same time that by its astringent Quality, it closes the Fibres of that Gut, by its heat it fortifies the erecting Muscles.

What is most troublesome in these sorts of Infirmities is, that every time the Patient goes to Stool the Intestine falls out again, or at least is ready so to do: To avoid which, we order the Patient to sit at that time on a narrow distance betwixt two Boards, that the Buttocks being thereby clos'd the falling out of the Intestine may be prevented; he must extend his Legs, and strain as little as possible in the discharging of his Excrement. We may also on a single Plank make a hole about the Diameter of a half Crown, and around it place a small Roll or Cushion, which comprehending the circumference of the *Anus*, will hinder the falling of this Gut when the Patient goes to Stool: If it be a Child, its Mother, or she who has the care of it, by clapping two of her Fingers to the *Anus* when it voids its Excrements, will prevent the frequent falling of the *Rectum*: And to conclude, all the times which it comes out, it must be wash'd with the Wine above-mentioned, then restor'd, and always kept up with the *Bandage*, and a *Bolster* moisten'd in the same Wine, which will accustom it to continue in its Place, as I have several times seen.

Some Authors are cruel enough to advise the Application of several actual Olive-pointed cauterising Irons red Hot around the *Anus*, to cauterise the circumference of that Part; they pretend by these means to consume the Humidity which relaxes the erectory Muscles, and hope that the cicatrising which remain, closing the *Anus*, will hinder its falling down again. I never saw this Operation practis'd, and I believe if a Chirurgion should be inclin'd to perform it, he would not find a single Person who would not oppose it, and with Justice, since 'tis possible to cure Diseases without making use of red Hot Iron, which strikes a horror even into those who do but hear it mention'd.

Monsieur Blegny, who did not want for Inventions, would have us detain the Intestine in its place with a *Turkey-Cock's Claw*, which is to be blown up in order to swell its Bulk after 'tis introduc'd into the *Anus*, which hinders that Gut from descending. But as this Machine must be taken out and put in again every time the Patient goes to Stool, and it being on those Occasions that the Intestine falls down afresh, I take it to be of very little use, and very inconvenient to be used, and that the rather because Bolsters and Bandage answer the same end; and are not so troublesome.

The Word *Condyloma* is deriv'd from *Kondylos*, which signifies a Joint; and was given it by Resemblance, by reason that the little Tumours which compose the *Condyloma*, are like the Tumours made by the Joints.

The *Condyloma* is a *Tubercle* or Callous Eminence, which arises in the folds of the *Anus*, or rather a swelling and hardening of the wrinkles of that Part. These Tumours frequently happen to the Orifices of the *Uterus*; they are caus'd by the Fluxion of gross and terrestrious Humours to this Place, where we sometimes find Inflammation and Pain, and always a hardness which must be soften'd by Emollient Medicines: We have seen it yield to these Remedies, and cur'd without being oblig'd to make use of Operation. But when general and particular Remedies prove unsuccessful, we must have recourse to the Hand.

We cannot exactly trace out the manner of operating, because it depends on the Figure of the *Condyloma*; if its Basis is narrow, we are to tie it with a Linen Thread or Silk, and having well tited the Ligature at several times, wait its falling off of it self: If the Basis be too broad to suffer a Ligature, the Chirurgion must cut it off with Scissars, holding it fast with his Pincers, and so separate it wholly at once. But if the Scissars are not proper, because its shape is inconvenient, or 'tis too hard, he makes use of the Incision-Knife, with which he cuts it off very near its Root; and if a great quantity of Blood issues out, which most commonly happens, by reason of the number of Veins which bedew the *Anus*, we stop the Flux with astringent Powders, and

then dress the Wound with Mundicatives, to waste and consume its Roots, and procure a cicatrising by Desiccatives.

About the Fundament there sometimes grow several Excreſcencies, which are call'd *Criſta* or *Combs*, by reason that they resemble *Cock's Combs*; it very seldom happens, that we find one alone, there are generally several of them which border on the *Anus*. When these sorts of *Criſta* are small, and don't incommode the Patient, I should advise the leaving them untouch'd; but when they grow too big and troublesome, we must get rid of them, which is always by Operation; which is perform'd either by *Ligature*, *Cauterisation*, or *Amputation*.

Of these three the last is the best, by reason 'tis more expeditious and certain: The Chirurgion takes a pair of Scissars, and in the other hand holds one of the *Criſta*, which he cuts off close to the *Anus*, thus cutting them all off one after another; and when he has suffered a little Poring or two of Blood to run off, in order to discharge the Part, he sprinkles on the Wounds astringent Powders to stop the Flux; and afterwards dresses all these small Wounds with such Ingredients as are proper to cicatrise them with the greatest Expedition.

Rhagades produce a sort of *Scissures*, *Cb ps*, or *Creviſſes*, which appear on the *Anus*. The word *Rhagade* comes from the Greek Verb *Rizein*, to cut, because the *Anus* is all over intersected by these sorts of Clefts, which produce narrow long Ulcers, which very much incommode the Patient, especially when the *Anus* is forced to open it self to admit the Passage of the Excrements: The *Acrimony* of the Humours, and the hardness of the Excrements are the causes of these Indispositions, which, in their beginning, are cur'd by desiccative Remedies, such as the Vulnerary Water; but growing old and confirm'd, they become Hard and Callous, and then their Callosity must be consum'd, in order to give us hopes of a Cure.

There are two ways of removing this Callosity, one is by Caustick, and the other by Cauterising. Some Practitioners make use of corrosive and mordicant Unguents, others prefer the Incision-Knife, with which they renew and refresh these sorts of Ulcers. As for me, I advise the use of both these Means;

to begin with the Incision-Knife, with which the Callosities are to be cut in several Places, and then to proceed to the use of less corrosive Unguents, than if we had at first began with those Remedies. By these means we complete the Consumption of those Hardnesses with less Pain, drying the Part by little and little, and with proper Drugs we procure the cicatrising of the Wounds, which we have made or renewed.

There happens besides to the *Anus* a *Carcinous Extrescence*, which is call'd *Ficus*, i. e. a *Fig*; as also *Sarcoma*, and a *Fungus* or *Mushroom*: 'Tis besides by the Vulgar term'd *St. Fiacre's Disease*. This Carnosity rises and grows as Mushrooms do on Oaks, and comes in the Neck of the Matrix, and several other Parts of the Body; but those of the *Anus* are more difficult to cure, by reason of their Situation, the Humours flowing to them in great Quantities, whence there issues out of it a very filthy stinking *Saniem*.

The Operation consists in the Extirpation of the *Fungus*, which, in process of Time coming to grow, would more and more incommode the Patient. We prepare the Body by general Remedies, as *Phlebotomy* and *Purgations*; then with the *Incision-Knife*, we cut off the *Fungus* near its Root; after which we apply to the Wound *Oil of Vuriol* temper'd, *Powder of Savin*, and other Remedies, in order to consume the remainder of its Roots. If its Basis is Small and Tender, it must be bound with a *Thread*, which must be guided by the *Forceps*, and drawn thither every day 'till the *Fungus* falls off.

There is yet another sort of *Malignant Fungus*, rooted in the *Rectum*: There is an Hospital maintain'd at *Rome* for the cure of Patients afflicted with this Indisposition. I have seen the Dressing of these unhappy Wretches, in which the Chirurgions spare neither Iron nor Fire, and the Cries utter'd by them do not move the Pity of their Chirurgions or Spectators, by reason the Sore is the consequence of an infamous Converse with Men, as the Venereal Distempers are of the caressing of debauch'd Women, and because these obstinate Tumours are look'd on as an Effect of the Divine Justice, which punishes such as commit those Crimes. But *France* being so happy, as not to have these Distempers known in its Territories, I shall say nothing more of them. Ac-

According to *Fabricius*, the Etymology of *Hæmorrhoids* comes from the Greek Word *Hæma*, which signifies *Blood*, and the Verb *Rheo* to *Flow*, to express its being a Flux of Blood. *Thevenin* says, that they took their Name from a Serpent call'd *Hæmorrhœis* or *Flux of Blood*, whose biting excited a Flux of Blood in several places of the Body of the bitten Patient. They have imparted their Name to the *Hæmorrhoidal Veins*, by reason this Distemper generally comes on the Extremity of the Veins of the Fundament.

The *Hæmorrhoids* are painful Tumours, shap'd like *Varices*, full of gross Blood, and proceeding from the Dilation of the Extremities of the Veins, surrounding the *Anus*. There are four sorts of them which differ amongst themselves, with regard to the Matter of which they are composed. We call those *Uval* which are full of pure and natural Blood, whose only Fault is excess in Quantity. We term those *Morales*, which are produced from a Thick, Gross, Black Blood: Those are stil'd *verrucal*, which are hard and full of Adult and melancholy Blood; and *vesical*, those which are form'd from a crude pituitous Humour. These Names are given these several Species, on account of the Resemblance which they bear to a Grape, a Mulberry, in Latin, *Morus*; a Wart, in Latin *Verruca*; and *Vesica*, a Bladder.

The Ancients set up several other different Species of *Hæmorrhoids*; they distinguished between Internal and External, alledging the one to proceed from the *Vena Cava*, and the other from the *Vena Porta*, that the former voided pure, and the latter gross Blood; that those which proceed from the *Vena Cava*, purge the *Plethora*, and those from the *Vena Porta* the *Cacoehymia*. But the Circulation of the Blood informs us, that these Veins carry nothing to the *Anus*; and that on the contrary, they only return back into the *Vena Cava*, the Blood sent thither by the *Arteries*. So that all these Veins are filled with the same Blood, which scarce being able to reascend, and staying in these Vessels, by slow degrees dilates them, and forms the Tumours which we call *Hæmorrhoids*.

Authors assign several Causes of the *Hæmorrhoids*, and several useless Arguments have been form'd; but without troubling our selves with what the Ancients have said,

we need not only examine the Mechanical Structure of the Part, in order to be inform'd truly how the Piles are produced.

In my Anatomy I have shewn, that the *Hæmorrhoidal Arteries* send out more branches to the *Rectum*, than are requisite for its Nourishment, that a great Number of these small Arteries terminate at the Glands with which they are interspers'd; that these Glands separate and filter part of the Impurities of the Blood, which are dispers'd by the Vessels which perform the Excretion of these Filtrations into the *Rectum*, so that this multitude of Conduits is necessary to the Purification of the Blood. I add, that we pay very dear for this Service which the *Hæmorrhoids* do us; and, indeed, the thinnest Lympha separating it self from the Blood, when it passes from the *Hæmorrhoidal Arteries* in the Veins of the same Name, it ought to be thicker and heavier than when in the Veins; and consequently cannot reascend without Difficulty; the rather, besides that there being no Muscles, nor any part which can assist its Advancement to the great Trunks, because the *Rectum* is lodg'd in a bony Basin; which will not allow any Compression to favour its Course, as the Muscles do that of the Blood which is obliged to reascend from the Extremities: This Humour cannot mount upwards, unless when the *Hæmorrhoidal Veins* being extremely fill'd by the Arteries, which incessantly furnish them, discharge themselves into the *superior Veins*, which empty themselves with more ease. The Efforts made on any occasion whatsoever, and particularly for the expulsion of the Excrements, contribute very much to the production of the *Hæmorrhoids*, because that instead of helping on the return of the Blood, they force it towards the *Anus*, where being obliged to remain in the *Hæmorrhoidal Veins* as in a Sack, it constrains them to extend, and cause this cruel Disease, from which scarce any Person is exempt.

The Piles are easily known, with a touch of the Finger, or a cast of the Eye, we discover Tumours of a different Size. Some are as big as Hazle-nuts, and others as large as small Eggs; their Colours also vary in proportion to the length of time which the Blood has continued there. These which I am speaking of, are the external *Hæmorrhoids*;

hoids; besides which, I know no other; for as for those stiled *Internal*, I never saw any of them, nor have I any Notion how they can possibly be form'd. I know only that several call other Indispositions which affect the *Rectum*, by the Name of *internal Hemorrhoids*.

The cure of the *Hemorrhoids* is very difficult, not to say impossible. Authors have propos'd two Methods, which are the Palliative and Eradicative: But I should never advise the Chirurgeon to undertake any farther than the former, it not being in the power of Physick and Chirurgery to compass the latter.

Before the Chirurgeon ventures to undertake any thing, he must examine whether the *Hemorrhoids* are *Obscure* or *Fluid*. We call those obscure from whence no Blood issues, and those fluid which void that Liquor from time to time. I say from time to time, because they do not emit a great Quantity, unless when the Patient goes to Stool, and what comes out the rest of the Day, amounts to no more than a draining, which only stains his Linen.

When the Piles issue forth only in a moderate Degree, the Patient is not to be touch'd, by reason 'twould be fully as prejudicial to a Man labouring under this light Indisposition, to attempt to Cure him, as to a Woman to suppress her Courses. 'Tis the Foundation of the Health of many Men, some of which have them as regularly as Women their Terms, and also find themselves indispos'd when this Flux has been retarded some Months. But when 'tis excessive, when it weakens and emaciates the Patient, and turns his Complexion to a fallow Tawny, endeavours are to be us'd to mitigate their Flux, but not to suppress them; and in this case we are oblig'd to the observance of a twofold *Regimen*, the one *Universal*, and the other *Particular*. By the former we understand the Course of Diet, which avoids all Edibles which produce too much Blood; Phlebotomy, which evacuates it; the Potions and Drinks which dilute and dulcifie the Acrimonious Humours, and the Patient's sedulously avoiding all manner of Melancholy and Angry Transports; and lastly, the use of Stypticks, and those Medicaments which thicken the Blood,

as Rice, Quinces, and substantial Wine, as also Chalybeat Waters. By the *Particular Regimen* we mean the Remedies apply'd to the Part, which are to be Astringents, as small Pags fill'd with Sage, and Bran, fry'd with Oil of Roses, Myrrh, &c.

Tho' the *surd Hemorrhoids* are not Fluid, but attended with Inflammation and Pain, we must begin with asswaging the latter; which is done by the Application of emollient Remedies, to this Part, of which sort are *Pulp of Cassia*, *Pomatum* compos'd of *Populeum*, and the Yelk of an Egg, Milk in which has been boil'd in *Chervil*, *Plantane*, and *white Mulleyn* or *Verbascum*, and several other Ingredients whose number is infinite, and of which there are as many sorts as for the Gout and Toothach. The Patient must also be blooded, to prevent the Blood repairing in any quantity to that Part.

When after the use of all these Remedies the *Hemorrhoids* don't diminish, but the Pain and Tension Remain, or increase, we must make use of means to empty those Tumours; which are of two sorts, either the Application of Leeches, or Punction by the Lancet. The use of Leeches is preferable, as well because the Patient is less afraid of them than the Lancet, as by reason they make a smaller Orifice, which is easier cured: A Leech is then to be apply'd to each *Hemorrhoid*, and left to draw till it be emptied, after which it is made to fall off, then the Chirurgeon makes use of a *Liniment* compos'd of Oil of Eggs, powder'd Ceruse, and calcined Litharge, laying on the *Hemorrhoids* a Pledget thoroughly moisten'd in this *Liniment*, a Bolster above that, and over both a Bandage, which a little pressing them, hinders their speedy filling again.

If the Leeches happen not to bite, or we believe the Blood to be too thick to be drawn by them, so that we are forc'd to make use of the Lancet, the Orifices must be made at the lowest place to empty them the more Commodiously, and the punctures are not to be made larger than just what is necessary to give issue to the Blood; which done, the *Liniment* and *Apparatus* is apply'd as above.

The Patient finds relief immediately after the emptying the *Hemorrhoids*, and the Cessation

sation of Pain and Tension afford him the refreshing gust of a very agreeable Ease; but there yet remains a continual draining thro' the Orifices which becomes very troublesome, though there is none but must own that 'tis preferable to the former Pains, and the pernicious Consequences which would attend them, if not Suppressed. Notwithstanding all which, we meet with some Patients who growing impatient under the offensive foulness of this Distemper, forget the essential Reasons which should dissuade them from desiring an eradivative or perfect Cure; and cost what it will, resolve to oblige us to perform the Operations necessary to the utter extirpation of this Disease: In this case the Chirurgeon is to excuse himself, by representing to the Patient, that besides the Pains of the Operation, yet more considerable ills may happen to him than those he is desirous to be exempted from; also acquainting him, that all our Predecessors agree in prognosticating Diseases to fall on those who are perfectly cured of the Piles; and withal proposing to him the Expedient agreed on by all Chirurgeons, which is to leave open one of these small Tumours, in order to retain a little Drain, and not

to expose the Patient to all the Diseases with which the most famous Chirurgeons menace them.

When the Patient is resolutely determin'd, he is to be prepar'd by frequent Bleeding in proportion to his Strength, and by some Purgations. The Chirurgeon gives him a Clyster a few Hours before the Operation, to empty the *Rectum*, and then obliges him to lie on the edge of the Bed, on his Belly, with his Feet down, and his Buttocks turn'd to the Light, which he causes to be separated from one another by a Servant: Then taking in his Left Hand, with the Forceps, the Purse of each *Hæmorrhoid*, he cuts them one after another with the Scissars, which he holds in his Right Hand, remembering to leave one of the least remaining for the preservation of the Patient's Health, as we have already hinted. If any of these Purses should be left, because 'twas impossible to cut them by reason of the Blood interrupting the Operation, 'tis afterwards to be eaten off with Ointments proper to that End. The *Apparatus* is like that of the precedent Operations, and that which I am going to shew you on the *Fistula* in the *Anal*.

Of the Fistula in Ano; with a Figure for the Operation.



A *Fistula* is called by the *Greeks* *Syrinx*, a *Flute*, derived from the Verb *srizein*, to *whistle*, and that *Metaphorically*, by reason this Distemper has a long strait Cavity like that of *Flutes*. It is defined to be a deep and cavernous Ulcer, whose Entrance is narrow, and its Bottom broader, and from it issues a sharp and virulent *Pus* or Matter, and is almost always attended with a Callosity.

Fistula's come in several Parts of our Bodies, after Abscesses, and Wounds of the Breast, the Lower Belly and Joints; and more frequently in the *Anus* than any other Part. 'Tis the Operation performed on the

last which I shall demonstrate to you at present, referring you for the Cure of the others to that of *Fistula's* in general.

This Disease seems at present to be more rife than formerly: We every Day hear of Operations performed on such Persons as did not before seem afflicted with it: 'Tis a Distemper grown in Fashion since that which the King had, and on which the Chirurgeons were forced to perform the Operation in order to its Cure. Several of those who before that Time carefully concealed their having it, are not now ashamed to publish it; and some Courtiers have even chosen *Versailles* for the Place where they will under-

undergo this Operation, because the King should be informed of all the Circumstances of their Indisposition. Those who have only a small Draining run immediately and turn up their Posteriors to a Chirurgion for him to make an Incision. I have seen above thirty who desired to have the Operation performed, and whose Folly was so great, that they seem'd angry when they were assured that they did not at all want it.

The *Fistula* in the *Anus* is always a Consequence of an Abscess in that Part. It begins with a small Hardness, which quickly increases and ripens: 'Tis ordinarily taken for an *Hæmorrhoids*, whence the shewing it to the Chirurgion is often neglected. This Abscess breaking either in the Intestine, or on the Edge of the *Anus*, the Patient finds himself eas'd, and then believes himself cured without the Chirurgion's Help, in which he is mistaken; for the Matter having made but a small Orifice to run out, remains in the Place where there is a Vacuity, and from thence continually issues out, but is never cured without opening the Sack or Purse to cleanse it, and procure the Return of good Flesh to fill it up entirely.

When the Patient requires the Assistance of the Hand before the Abscess is broken, the Chirurgion is not to stay till it breaks it self, because the Matter will corrode the whole Circumference of the Part to make its Way; and the Intestine being more tender than the Skin, it will rather make an Orifice in that, than pierce the Skin, in order to issue out: And besides, this Corruption continuing amongst the fleshy Parts, it separates them; so that the Intestine being denudated, can never reunite with the neighbouring Flesh without Operation. To prevent these Symptoms, we must then early open these Abscesses, and not wait for a great Fluctuation, as in other Abscesses; but they must be taken green, that is, before they are perfectly ripe. We must not make the Aperture with *Cauterics*, for fear of losing Time, and (by the Pain which they give) furnishing an Opportunity to a greater Settlement of Humours in that Part, and to Mortification; for they gangrene in a very small Time after. The Chirurgion then first of all with the Lancet *A*. makes an Orifice to evacuate the Matter; then with the Scis-

sars *B*. cuts the Side which has the most Room, sufficiently to convey the Remedies to the Bottom of the Cavity, in order to cleanse and heal it. But if on thrusting a Finger into the Wound which he shall have made, and another into the *Anus*, he finds the *Rectum* denudated or strip'd, which he will discover by the Thickness which he feels betwixt his two Fingers, he must then cut that Intestine to the Extremity of the Abscess, in which he is to guide himself by insinuating one of the Branches of the Scissors into the Wound, and the other into the *Anus*, in order to cut all that is betwixt them both: Also he must cut the Gut a little more forward than the Bottom of the Abscess, because that he ought rather to risque the making the Thickness of two Crowns larger than necessary, than the Thickness of one less. The Abscess thus well open'd, is to be dress'd, as we shall presently shew in the Operation of the *Fistula*.

This is what is to be practised to avoid a *Fistula*; but when 'tis form'd, either by the Negligence of the Chirurgion, in not sufficiently opening it, or the Obstinacy of the Patient, who would not before consent to its being open'd, the Nature of the *Fistula* must be examined, before the Operation is concluded on.

There are laid down three Sorts of *Fistula's* in general: The first, when the Ulcer is open without, and not within; the second, when it pierces the Intestine, without issuing outwards; and the third, when it communicates without and within. The first are apparent, and easily discover themselves; and the Probe which is introduced, informs us whether they are superficial or deep. We are ascertain'd of the Existence of the second, when we find corrupt Matter issue out with the Excrements, and particularly when an Abscess has preceded; and by thrusting the Forefinger, we are satisfied whether the Orifice be distant from or near the *Anus*. The third are discovered by thrusting the Probe *C*. into the *Fistula*, and the Finger into the *Anus*; for if we feel the End of the Probe with our Finger, we may depend on it that the Gut is pierced: The small *Dilator D*. introduced into the *Anus*, is very proper to search it. We call these last *Fistula's* complete.

pleat ones; and the first imperfect, because they have but one Orifice.

Every one of these Species is also subdivided into several Sorts; some of which are near the *Anus*, others one or two Fingers Breadth distant from them: Some are at the Edge of the Intestine, and others deeper in. We find some with one Cavity, and many with several like a Goose's Foot; and these various Cavities are named *Coney-boroughs*: Some incline towards the *Rectum*, and some towards the Bladder, or the Hip-bone. To conclude, they are either recent, or old and callous.

The Chirurgion is to prognosticate according to the Nature of the *Fistula*, and without promising more than he can perform, to be always dubious; for what Appearance soever there may be of Success, there frequently happen some Accidents which hinder the accomplishing of what he has promised.

Three Ways of curing *Fistula's* are proposed, *viz.* *Cautericks*, *Ligature*, and *Incision*. After we shall have examined them all three, we will decide which is the best.

About thirty Years since, one *le Moyne* at *Paris* acquired a great Reputation for the Cure of *Fistula's*. His Method consisted in the Use of *Cautericks*, that is to say, with a corrosive Unguent, with which he cover'd a small Tent, which he thrust into the Ulcer; by which he daily by little and little consumed the Circumference, taking care to enlarge the Tent daily; so that by widening the *Fistula*, he discovered its Bottom. If he found there any Callosity, he corroded it with his Ointment, which also served to destroy the *Coney boroughs*; and at last, with Patience, he cured many. This Man died old and rich, by reason he made his Patients pay very well for their Cure, in which he was in the right; for the Publick value Things no otherwise than in Proportion to the Sum which they cost. Those who were affrighted at the Thoughts of the Scissars threw themselves into his Hands; and tho' the Number of rascally Pretenders is very great, yet they never want Practice.

Thevenin prefers Ligature to the two other Ways of curing a *Fistula* in the *Anus*. He affirms, that he never knew it miss of full Success, and advises it to be thus performed:

The Patient is to stand on his Feet with his Body bent, and resting on the Edge of the Bed, he must first of all be ordered to open his Legs and Thighs, which the Chirurgion must cause to be held firm by two Servants, for fear he should close them again, and grow weary during the Time of Operation. The Patient thus disposed, the Chirurgion thrusts into the *Anus* the Forefinger of his left Hand, after having rubbed it with Oil of Sweet Almonds, or some other oleaginous Matter, to procure its more easy Entrance; then in his right Hand he takes the Probe *E.* made of soften'd Brass or silver Wire, and threaded with the double brown Flax Thread *F.* or with an Hair out of a Horse's Tail, in order to cut the more readily. He introduces this Probe into the Orifice of the *Fistula*, and meeting the End of it with his Finger already in the Intestine, he bends it back, and draws it out at the *Anus*, bringing with him one of the Ends of the Thread; which being come out, with that, and the other End which runs through the *Fistula*, he makes a Ligature with a slipping Knot, and daily draws it tighter, till it has cut through the Place which it contains. If the *Fistula* was imperfect, and the Intestine not yet pierced, he must not make any Difficulty of piercing it with the Extremity of the Probe, which is easily done, by resting it on his Finger which is in the *Anus*; after which he bends the Probe, and ties the two Ends of the Thread as before directed.

The third Way is by *Incision*; which being the most universally practised and followed, I shall enlarge more on that than the others, to avoid the Omission of any Circumstance, and in order to instruct young Chirurgions the more exactly. To this End then, 'tis first of all to be observed, that before the Operation the Time is to be chosen; for in Summer or Winter, the Excess of Heat or Cold may oblige the Chirurgion to stay till the Air grows moderate, and the Operation may be deferred without any Danger, whilst the *Fistula* is recent. He must then prepare the Body by Bleedings and Purgations adapted to the Patient's Constitution; and having fix'd the Day and Hour, he is to dispose the *Apparatus*, such as you see in the Cut.

Two Hours before the Operation, a Clyster is to be given, in order to empty the Intestine, for fear the Strains which it may excite may otherwise force the Excrements to fly into the Chirurgion's Face, as it sometimes happens; for which Reason also he should not place himself directly behind the Patient, but a little on one Side, to avoid this Fussie, which will prove very disagreeable. The Patient is to be placed on the Edge of the Bed, with a Pillow under his Belly, in order to raise up his Buttocks, which must be turn'd to the Light, his Thighs open'd and held by two Servants, to prevent his stirring in the Time of the Operation.

Secondly, During the Operation, the Chirurgion (as in the Ligature) must be provided with Oil *G.* with which he must rub the Forefinger of his left Hand, in order to introduce it into the *Anus* without Pain; and in his right Hand he takes the Stiletto *H.* which he introduces into the *Fistula* by its exterior Orifice, guiding it along till it comes out at the Hole in the Gut, which he will feel with his Finger which is in the *Anus*; then with the End of the same Finger he bends the Stiletto, and causes it to come out at the Fundament in such Manner, that all that is to be cut is grasp'd betwixt its two Branches; then with the Incision-knife *I.* or the Scissars *K.* he cuts at once or twice the Flesh contained betwixt the two Branches of the said Stiletto, assuring himself that he has cut all that he ought, when that Instrument is entirely loosen'd and disengaged. He then thrusts his Finger to the Bottom of the *Fistula*, which frequently is full of Cavities or Coney-boroughs, which as far as possible, he ought to open to their Bottoms; and if with the Finger he finds any Callosities in the *Fistula*, with the same Incision-knife he makes several small Incisions on the harden'd Places, that the Remedies may eat and consume them. Some, instead of the Stiletto, make use of the hollow Probe *L.* which they bend in the same Manner, and its Gutter helps them to guide the Point of the Scissars.

Thus all good Practitioners have hitherto performed this Operation; but it has of late Years been improved, and Ways have been discovered of performing it more expedi-

tiously. There has lately been invented a curve Incision-knife *M.* at the End of which is fasten'd a Stiletto *N.* so that instead of two separate Instruments, they make use of but one, which is both a Stiletto and Incision-knife together, which they use in the following Manner. By a small Incision made with the common Incision-Knife, they enlarge the External Orifice of the *Fistula*, in order to introduce the more easily the Incision-Knife with the long Stiletto, which is Pointed, and of a soften'd Metal, that it may be bent without Pain; this Incision-Knife must be Curve, Thin, Narrow, having the Edge cover'd with the Chape *O.* of Palteboard or Silver, that it may be thrust into the *Fistula* without hurting the Patient; after which, pursuant to the old Way, the Chirurgion must thrust his Finger to the bottom to feel for Cavities or Callosities, which are to be Remedied, as we have already told you.

Thus you have seen two ways of performing the Operation on the perfect *Fistula*; they are both of them equally good, because they open the *Fistula* to the bottom, and differ no otherwise than with Regard to the Instruments which are used in them. Let's next see what is to be done to imperfect *Fistula's*.

I have already inform'd you that in the performance of the Operation with the Ligature, when the Intestine is not open, it must be pierc'd, to contain all the Flesh which the Thread is to cut; and 'tis in this absolutely necessary to pierce it with the Stiletto, without which the Operation will be Imperfect: But the Intestine is so tender that it makes but a very small Resistance: When the Stiletto has made a hole in the Intestine in the bottom of the *Fistula*, 'tis to be drawn out by the *Anus*, and continue the Operation in the manner which I have just shewn.

If the *Fistula* is open only in the Gut, and not outwards, the Operation is more difficult, for to perform it we are obliged to find a way to make an external Orifice: To this end the Chirurgion examines whether there is not some small Tumour around the *Anus*, which indicates that it is the external end of the *Fistula*, and if we don't find on the Skin any Alteration, or redness which marks the empty Place; by reason on

ony such Appearances 'twill be proper to open those places to thrust the Instrument thro' them, and continue the Operation as above. When nothing is to be seen without, which can discover to us where we ought to open it, we take the Stiletto *P.* which is folded double, and one of whose ends is longer than the other; holding it by the longest End, we then introduce it into the *Anus*, and at the Moment that we draw it back, guiding it with the Finger already engag'd in the Intestine, we endeavour to get the shortest end of the said Stiletto into the Orifice of the Fistula, then drawing it to us, we feel without the end of the Stiletto, on which we open the Part, and with the Instrument which we slide into it finish the Operation.

Thirdly, After the Operation the Wound must be dress'd with a large Stopple *Q.* shap'd like a Tent, which is to be moisten'd in a Liniment, compos'd of Oil and the Yelks of Eggs, and forc'd into the *Anus*, to widen the separation of the Lips of the Wound, and afterwards lay on the Pledgets *R. R.* cover'd with the same Liniment: The Plaster *S.* the long Bolster *T.* then the square one *V.* must all be apply'd in their order, and fasten'd by the Bandage *X.* The Patient must be put to Bed, or left to compose himself to rest 'till the Evening, when the Chirurgion takes from him three small Porrengers of Blood, to avoid a fresh settlement of Humours on the Part Affected.

These sorts of Wounds are very troublesome to dress, by reason that the Part Affected is the Passage of the gross Excrements, and that a Flux of the Belly supervening the Operation, obliges the frequent taking off the *Apparatus*, and Dressing. For which reason the Chirurgion leaves an Apprentice to lie in the Patient's Chamber, in order to dress the Wound as often as the Patient goes to Stool: But the Operator must endeavour to regulate this Evacuation, so that it may not happen above once a day, and then he must send an Apprentice an Hour before to take off the *Apparatus*, that the Patient being seated on a Close-stool, may continue some time there in order to obtain a good Stool: After the Patient has emptied his Intestines, the Wound is to be wash'd with warm Wine before 'tis dress'd. The Chi-

surgeon always makes use of a Stopple cover'd with a very strong Digestive, to cleanse it from and prevent the growth of proud Flesh, which frequently happens in these Parts; the same course is to be daily continu'd, carefully avoiding the lessening of the Stopple faster than the bottom of the *Fistula* fills with Flesh; next we dry up the Wound, and endeavour to bring it to cicatrise well.

'Tis not difficult to decide which of these three ways is to be prefer'd. The Cautstick causes a continual Pain for five or six Weeks, during which time we are oblig'd to make use of it. The Ligature is long in cutting the Flesh thro', and must without fail be tighted every Day, which is not done without Pain. Incision indeed inflicts a more poignant Pain, but of so short a Duration, that it ought not to alarm a Person who is willing to be cur'd without danger of any Relapse; for it not only accomplishes in a Minute, what the two others don't perform in less than a Month, but yet the Cure that way is certain, whereas 'tis but dubious by the others.

These Reasons determin'd the King to chuse the Incision, after having examin'd all other Methods propos'd to him for the Cure of the Fistula, of which I will relate the History in few Words.

In the Year 1686. there arose near the King's *Anus* a small Tumour, inclining towards the *Perinaum*: It was neither inflam'd nor very Painful. It grew slowly, and after ripening, broke of it self, by reason that the King would not suffer Monsieur *Felix*, his Principal Chirurgion to open it, as he propos'd. This small Abscess was attended with the ordinary Consequences of those not sufficiently open'd, to admit the Application of Remedies to the bottom of the Cavity; there was only a small Orifice, thro' which the Matter ran, it continu'd to suppurate, and at last became Fistulous.

The sole way left of curing it was Manual Operation; but the Great cannot always be brought to yield to it. A thousand Persons propos'd Remedies which they pretended to be Infallible, and some of them which were concluded to be the best were try'd; but none of them succeeded.

His Majesty was told that the Waters of *Barege* were excellent in these Cases, and 'twas also reported that he would go to those Waters; but before taking that Journey, he thought fit to try them on several Patients; four Persons were found who were afflicted with the same Distemper, and sent to *Barege* at the King's Expence, under the Direction of Mr. *Gervais*, Chirurgion in Ordinary to his Majesty: He made the necessary Injections of this Water into their Fistula's for a considerable time, and us'd the proper means for their Cure, and at last brought them all back, as far advanc'd towards that end as when they first went thither.

A Woman reported at Court, that going to the Waters of *Bourbon* in order to be cur'd of a particular Distemper, she was by the use of them cur'd of a Fistula, which she had before she went thither. One of the King's Chirurgions was sent to *Bourbon* with four other Patients, who return'd in the same Condition in which they went.

A *Jacobine Fryer* applying to Monsieur *Louvois*, told him that he had a Water with which he cur'd all Fistula's; another boasted of a never-failing Ointment, and yet others propos'd different Remedies, alledging the Cures which they pretended to have done. That Minister determining to neglect no means in order to the procuring a Restauration of a Health so important as that of the King, caus'd several Chambers to be furnish'd, in which he placed Persons afflicted with Fistula's, and caused them to be treated pursuant to the several Methods of the boasting Pretenders to cure them, in the presence of Monsieur *Felix*. A Year was spent in these various Essays, and not one Patient cured.

Monsieur *Bessiere*, who examined the Indisposition, being ask'd his Thoughts by the King, freely answer'd his Majesty, that all the Remedies in the World would prove Vain without Manual Operation. At last the King, to whom Monsieur *Louvois* and Monsieur *Felix* gave an Account of what had pass'd, seeing no hopes of being cured after any otherwise than by Operation, on which Monsieur *Felix* continually insisted, determin'd for it; but would not acquaint any Person with his Resolution: He delay'd it till his Return from *Fountain Bleau*, and one Morning had it perform'd, when nothing of that nature was suspected by the Courtiers; who going to attend the King's *Leved* were inform'd that he had undergone the Operation, and resolutely suffer'd all the Incisions which Monsieur *Felix* thought proper to be perform'd.

This happen'd on the 21st of November 1687. Monsieur *Felix* to whom the King had left the Liberty of appointing what Surgeon he pleas'd to assist him, chose Monsieur *Bessiere*, who was accordingly present at this Operation, where only were Monsr. *De Louvois*, and the two Physicians; Dr. *D'aguin*, and Dr. *Fagon*. The cicatrizing was very well manag'd, and the King perfectly cured: His Majesty also royally recompens'd all those who render'd him Service whilst under this Indisposition: He gave Monsieur *Felix* fifty thousand Crowns, Monsieur *D'aguin* an hundred thousand ivers, Monsieur *Fagon* twenty four thousand Livers, Monsieur *Bessiere* forty thousand Livers, and to each of his Apothecaries, in Number Four, twelve thousand Livers, and to one *Raye*, Monsieur *Felix*'s Apprentice four hundred Pistoles.

Of the Diseases and their Cures incident to Women and Children. From Michaelis, St. Hiliare, Harris de Morbis Infantum, Mead de Imperio Solis & Lunæ, &c.

Of the Straitness or Largeness of the Pudenda. Of the Clitoris, Neck and Labia of the Uterus, with the Pustles and Scabs of the Privities; together with the Condylomes in the Neck of the Womb, &c.

THE straitness of the *Pudenda*, if from the first Original and Conformation of the Parts is scarcely to be Remedied by Art, but if dilated from Coition it admits of a Cure: The first may arise from an Ulcer, or the unadvised use of Astringents; the latter, from too frequent Coition that enlarges the Orifice, from whence may come Barrenness, and a falling down of the Womb, which is to be remedied by Manual Operation. But 'tis Fomentatious, &c. The Relaxation is assisted by the use of Astringent Decoctions, and the like; with Alum, Comfry, Burdock Roots, and Galls, as for Example. Take *Comfry*, *Bole-Armenick*, *Dragon's Blood*, *Balaustians*, *Alum*, and *Mastick*, of each half an Ounce, in Powder, and make them into a *Pessary*: Or, Take *Plantane* and *Oak-Leaves* of each half a Handful, *Bindweed Roots* one Ounce, *Pomegranate Peels*, *Balaustians* and *Sumach* of each half an Ounce, *Alum* one Ounce, Boil 'em in Water, and foment the Parts therewith; some put up a piece of *Crude Alum* up the *Pudenda*.

In the cure of a Relaxed *Clitoris*, it is the best way not to proceed to Amputation at first, but rather wait for a Cure by trying Medicines; and therefore gentle Bleeding and Purging, with a slender Diet, is to be Prescribed, and Discussing Things, as *Olive* and *Lentisk Leaves*, with *Mynsichi's Tinctura Castitatis*; and if these succeed not,

Mild Catharticks and Causticks are to be applyed, especially such as do not put the Patient to a great deal of Pain; as Burnt Alum, or Ointment of *Ægyptiacum*, Oil of Rose and Wax, made into a Liniment: Likewise a *Lixivium*, of which a *Sapo* may be made with Roman Vitriol, and a little *Opium* form'd into *Troches*, and the Flesh sprinkled with the Powder: If none of these succeed, the Part must be cut off, with a Ligature of wax'd Silk, or a Horse-hair tied about the Root, and left there till the *Clitoris* fall off: Sometimes other Carnous Excrescences grow in those Parts, to hinder the Admission of the *Penis*, but of those we have spoke in another Place. There are three sorts of Obstructions of the Passage into the Womb, the first is in the Orifice, the second in the Neck, and the third in the *Vagina*; if an intire Membrane obstructs the outward Orifice, there remains nothing but Section, and likewise where the Ulcer closes the Lips; but if the same lies deeper, the cure is difficult and not without Danger: If it arises from a hard Tumour, it is relieved by Emollients; if from Flesh proceeding from the Ulcer, and the whole Passage is not stop'd up, you need not cut, before Evacuation, with drying and discutient Medicines, be attempted, especially such as lessen the Carnous Substance; as Frankincence, Birth Root, Myrrh, Aloes, Mastick;

or such as eat it off, as *Burnt Alum, Ægyptiacum, &c.*

In *Pustules* and *Scabs* on the *Privities*, such is the Effect of good Diet, it will restore the Temperament of the Body, by correcting the Humours that arise from a vitiated Aliment, especially by avoiding the Acid, and Acid Salts. Afterward it is necessary to correct and purify the Blood by proper Evacuations and Uterine Specificks, as thus; Take Jalap ℞j. Scammony, Sulphurate 4 Grains; the *Facula Brionice* 5 Grains, Oil of Sassafras 2 Drops for a Dose. Or, Take Fumitory Pills ℞j. Resin of Jalap 6 Grains, Magistery of the Peruvian Gum 4 Grains, with *Crollius's* Elixir or Essence of Mugwort, make Pills. Or, Take Fumitory, Balm, Penny-royal, of each a Handful, Roots of Briony, Spurge, Black Hellebore, of each prepared one Ounce. Jalap 6 Drams, Cassia Lignea one and half; Salt of Tartar half an Ounce. Infuse these in a Bag for a *Diet Drink* in two Gallons of Lime-Water, whereof drink half a Pint every Morning. But if, as it is common these disorders proceed from a Venereal Cause, then you must appropriate your Catharticks to the present Case, and add to the Forms before prescribed 20 or 30 Grains of *Mercurius Dulcis* well prepared; or give a Bolus over Night of *Æthiops Mineral* half a Dram, with a little Syrup of Mugwort, and purge it off the next Day with the *Diet-Drink*.

The *Condylomes* or Knots in the Neck of the Womb, if attended with an Inflammation are Hard, otherwise Soft; the Cause we must own to be an Acrid Malignant Humour, which is not void of a pernicious Venom or Poison; in the *Venereal* Cases they are both in the *Pudenda* and *Podex*,

their cure first considering Universal Purgatives, consists in proper Topicks. If the *Condylome* is Hard, and of long standing, it must be softened by Cataplasms, frequently apply'd, afterwards digested and dry'd up. Therefore the first thing ought to be a Fomentation, with the Emollients, especially of Mullein, and for your Driers use the Testaceous Powders: For Pain and Inflammation apply Oil of Henbane, Mullein, and some few Grains of Opium, and if nothing of this kind relieve, you must proceed to Section and Causticks.

The *Wheals*, *Warts*, or *Pustles*, upon the *Privities*, arise from a gross feculent, and sometimes a malignant Humour, that hath its Original Cause seated in the Skin, and therefore is most properly removed upon the Part, or by external Means, as dry'd Sage, Origanum, Rue, Savine, Frankincence, &c. then we may proceed to eroding Medicines, as the Juice of the Wild Cucumber, unripe Sloes, or the Juice of *Acacia*, Sheep's Dung, or Goat's Gall, with Salt, or Nitre; or if you would use Stronger, take Aqua Fortis used by the Gold Smiths, Spirit of Vitriol, or Sulphur, Butter of Antimony, and defend the neighbouring Parts from being injured by Bole Armeniack, Terra Lemnia made into a Paste with Rose Water; if these succeed not, you must draw the Warts out with Pinfers, and afterwards stop the Blood with such Powders as will cure the Wound, and make a Cicatrice: But if their Roots are Deep, tie a Horse-hair about each Wart, and so bind it Straiter every day till they drop off; if all these fail, you must use the Actual Caustery, and burn them off, applying at the same time proper Defensatives to the Parts.

Of the Hæmorrhoids, Ulcers, Rhagades, Fistula, Cancer, and Gangrene of the Womb.

THERE are little swelling Knots or Pustules arising from a Fæculent Conflux of Blood, out of the time of the Menstrual Purgations, that are sometimes what we call the blind *Piles*, and sometimes the bloody *Piles*, sometimes with, and some-

times without Pain. They are known both by Feeling and Seeing; and are often attended with Pain, and an inordinate Flux of Blood: They make the Woman look Pale, and complain of Weariness. Having Regard to the right Government of Diet, and

if need be to Purgation and Bleeding, in order to Revulse, we shall come to the present Relief, when the Piles are Painful and Troublesome, Take Oil of Water Lillies, and Camomil, of each an Ounce, Juice of Bettune two Ounces, Barley Flower one Ounce, boil them, and then add Saffron a Dram, and the Yelks of 3 Eggs, make this into a Pultise, and apply to the Fundament. To anoint the Part, use Oil of Mullein, and Linseed, Ointment of Poplar, and other cooling Ointments, but the most Efficacious both for the blind and bleeding Piles, is to touch them with Balsam of Sulphur, made with Oil of Turpentine, applyed hot to allay the Pain of the blind Piles, and dry up the Humour; use Bole Lemnian Earth, Acacia, Cerufs Litharge, burnt Lead, &c. but where the Part is swell'd or tumefied with much Blood, Emollient and discutient Remedies are to be apply'd, to wit, the Fumes or Fomentations of Marsh-mallows, Pellitory of the Wall, Dwarf-Elder, Camomil Flowers, Mullen, Melilot, Linseed, Fenugreek, &c. If these do not avail, the Knots are to be rub'd with Fig Leaves, Pellitory of the Wall, or live Swallows apply'd. If they flow moderately, Nature ought to be left to do her own Business; but in too great a Flux, Revulsion must be made by bleeding in the Arm, or applying Cupping-glasses, to the Superior Parts: Give likewise Tincture of Sulphur, or Vitriol, and the Crocus Martis Astringens in proper Vehicles.

Ulcers are often in the Womb it self, as well as the Neck thereof; and are produced from foul Humours, the Venereal Disease, purging or corroding Medicines, difficult Labours, &c. The Signs are, first Pain, and a perpetual grinding or gnawing; secondly, they are visible sometimes to the naked Eye; in the place there flows a Pus of different Smells and Colours; if the Ulcer is seated towards the Orifice of the Bladder, there is a burning Heat and Inclination to Urine, the Head Aches, and especially the Forepart. The difference of the Ulcers are known from the Purity or Foulness of the Matter flowing from them. The Pain is to be abated by Anodynes, with Steel infused in Milk, and the Whites of 3 or 4 Eggs, with Mucilage of Quince Seeds,

Emulsions of Poppy Seeds; Mix'd with the four greater cold Seeds, and Goats Milk; if the Pain is still greater, Take Barley Water, to which add the Juice of Henbane, or Opium, according to the greatness of the Symptoms: The *Ulcer* sometimes submits to gentle Means, as a Decoction of red Roses, or Plantane: Where the Ulcer is Foul you must deterge with Orrice Roots, and Honey, first washing the Parts with a Decoction of Mallows; likewise these things are serviceable, as Gum Ivy, Juniper, Mastich, Myrrh, Cadanum; but if the Ulcer proceed from a Venereal Cause, add a little Cinnabar; if the Ulcer is Corroding, and Spreads, wash it with the Vitriolick and Aluminous Waters, or the Phagedenick Water; Mix'd with that of Plantane, and a little Bole. Where the *Ulcer* is cleans'd, it must be incarnated and clos'd by a Cicatine, *Sulphureous Balls* both Natural and Artificial are proper: As to Internals, Rhubarb, and the lesser Centaury may be given to drink, according to *Dioscorides*; in the Putrefaction of the Afterbirth, the *Elixir Proprietatis* of *Paracelsus* is Profitable; likewise Turpentine made up with Sugar is serviceable in Erosions and Pains of the Womb, especially if used with a Scruple, or half a Dram of Pills of *Bdelium*. If the Body begins to Emaciate, and there be any suspicion of a Hectick Fever, give Asses Milk, with Conserve of Roses.

The *Rhagades* or Chaps, and Wrinkles in the Neck of the Womb, are long small Ulcers, like those that happen to the Lips, Hands, or Feet, in Winter Weather; sometimes they are Superficial, at other times Deep and Callous; they proceed either from hard Labour, or a Flux of Acrid Humours, and are often the Consequences of Inflammation and *Condylomes*; if Recent, this Disaffection is easy to remove; if of long continuance, and the Ulcers are Callous, they are difficult of Cure. If from a hard Labour these Fissures happen, we must use Injections of Roses, Birth-wort, Plantane, Bole, Dragon's Blood, and Frankincense, boil'd in Spring Water, or Pessaries made thereof, with the White of an Egg. The Flux of Acrid Humours requires universal Evacuation, and the Condylomes, peculiar Topicks, as before hinted; a Callous Fissure must be anointed with Oil of white Lilies, Deer's

Deer's Suet, Turpentine, and Wax, made into a Liniment if there be an Inflammation, or great itching joyn'd to the Former; Take Ointment of *Diapomphologies*, *Populeon*, of each an Ounce, Sugar of Lead and Camphore, of each a Scruple, Mix. Their Diet must be of moist Meats, and good Nutriments, abstaining from Acrid, Sour and Salt Things; likewise from too much Motion and Venery.

These Ulcers being neglected frequently degenerate into *Fistula's*, by reason of the Softness and Moisture of the Parts, from whence they become difficult of Cure. The Cause proceeds from the *Pus* that corrodes the Flesh, and carries on a Canal along the Vessels, sometimes to the very Neck of the Bladder or *Ulcers*, and sometimes to the *Anus*, so that the Excrements shall proceed thence: Having first a regard to Purgatives, and a due Regimen for Living, we must next make use of Sudorifics, and apply detarging and strengthening Injections, and sometimes a Plaister of *Diachylon Simplex*; and where the Cure is not despair'd of, drying Vulnerary Drinks are to be Exhibited; then proper Topicks, as Roots of Gentian to dilate the Orifice, and Emollients to soften the Callous, all which if resisted, recourse must be had to Manual Operation by Burning, Section, &c.

A *Cancer* of the *Womb* rarely attacks the Substance, but frequently seizes on the Neck of the *Uterus*, sometimes with, and sometimes without any *Ulcer*, it arises from the Acrimony of the Menstrual Blood, and now and then from the *Venereal Virus*, which procures a *Scirrhus* Tumour, this produces the *Cancer*, and if the Corruption be great, an exulcerated *Cancer*; it is known from a painful Tumour, and pricking upon the Part, with Hardness, with a livid reddish Colour, which is more grievous accor-

ding as it is ulcerated. This is often incurable, as well from the Matter as the Part Affected, especially if the *Cancer* is Ulcerous: However, where hopes are left, moderate Astringents and Coolers are of Service; as Juice of Night-shade depurated, six Ounces, Tutty prepared, burnt Lead, of each two Drams, Camphire half a Dram, beat in a Leaden Mortar, to the Consistence of an Unguent.

This Disease frequently turns to a *Gangrene*, either from the great Inflammation or *Ulcers* upon the Parts, or sometimes it comes from a Descent of the *Womb*, and is known from the unusual Heat there, as well as from the Fever and Trembling throughout the Body, after which the Colour of the Part is chang'd, and turns Livid; it is Soft and Dead, neither is there any Sense or Pulse remaining; so that you may cut without Feeling, and there is a great Stench: There likewise is a dejection of Spirits, the Heart is Heavy, and other dismal Symptoms appear in the upper Parts of the Body. This great Disaster has still greater Danger in delay, especially if there appears Corruption, or the Parts are Rotten towards the *Uterus*, then it is Mortal; but if otherwise, proceed to remove the corrupted Parts, and put a stop to the farther spreading thereof, by scarifying the Part, and washing with a Decoction of Wormwood and Myrrh, in Spirit of Wine; likewise clap on a Plaister, or the Ointment of *Aegyptiacum*, or a Pultise made of Barley and Bean-flower, with Fœnugreek-Seeds, and Oxyssel of Squills, to which if necessary you may add Aloes, Myrrh, Balsam of Sulphur, and Sugar of Lead; fortify the Internal Parts with good Cordials of Bezoar, Contrayerva, Goa-Stone, or the like.

Of the Inflation, Inflammation, Scirrhus, and Dropsie of the Womb, with the Descent, Weakness, and Pain thereof.

THE Cause of this Inflation is a Windy, Watry, Gross, Puitous Matter, contained in the Veins of the Womb, and there either generated or transmitted therein. The Signs are the appearance of a Tumour in the *Abdomen*, and Region of the *Uterus*, oftentimes extending it self to the Navel and *Diaphragm*, but never as the Dropsie coming to a great Bulk, neither does it provoke Thirst. This Tumour sometimes decreases by turns, and there are not those sharp Pains attending it, as are in the Inflammation of the Intestines. Women easily procure Inflations, if from the time of Delivery, or in their Monthly Courses they expose themselves to the cold Air, which readily insinuates it self into, and dilates the Womb. In this Case Purgatives are Convenient, as Pills of *Hiera cum Agoric*, the Catholick purging Powder, with some Grains of Castor, Carminatives, Extract of Castor, and Medicinal Wines, with Hystericks. But *Zacutus Lusitanus* advises to abstain from all kinds of Physick, and leave Nature to her self: Others propose an Instrument for the Eduction of Wind out of the *Uterus*, and which likewise in the Dropsie, and other disorders of the Womb brings forth Matter thence; and this is prepared from *Guajacum*, externally the Chymical Oil of Camomil, Rue, Bay, Cummin, Carui and Fennil are good, so are Bags of the Carminative and Hysterick Herbs.

But since the Inflation of the Womb seldom happens without Serum or Water; therefore Hydragogue Medicines are to be mix'd with Catharticks after this Manner. Take Pills of *Hiera cum Agarico* ℥j. Resin of Jalap, Scammony sulpherated, of each 5 gr. Extract of Elaterium 2 gr. with the same quantity of Castor: Make Pills thereof for a Dose. Or, Take the Phlegmagogue and Hydragogue Extracts, Scammony sulpherated, of each 6 gr. Mag. Gum, Peruv. 3 gr. Extract of Castor, Chym. Oil of Bay-berries, of each 2 gr. or the Catholick purg-

ing Powder ℥j. Tartar. Vitriolat. 6 gr. *Facula Brionæ* 4 gr. Mix for a Dose of Powders.

Take Pennyroyal, Camomil-flowers, of each a Handful, Roots of Briony, Lovage, of each an Ounce, white *Machocam*, *Esula*, prepared, of each half an Ounce, Orange Peels 3 Drams, Aniseed and Fennel, of each 3℥. True *Cassia Lignea* 3ij. *Facula* of Briony 2j. reduce these to Powder, and give half a Dram every other Day, letting the Patient drink after it the following Draught. Take Balm, Pennyroyal and Camomil Water, of each 3ij. Briony Water, Compound and Syrup of Orange Peels, of each 3℥. Apply a Plaster of Bay-berries, Cummin and Carui, of each ten Drops, with a due quantity of white Bee's Wax.

The immediate Cause of the Inflammation of the *Uterus* proceeds from the Flux of the Blood being pure or impure: The Signs thereof are the Actions and Parts of the Womb, since they are affected from their Consent therewith: Here appears a Tumour about the Region of the *Uterus*, with Heat, Distension, and Weight upon the Part; likewise the Fever is evident with the Dryness and Inflammation of the Tongue: If there be a Flux of pure Blood, all the Symptoms are Milder, but if biliary they are very Violent: This Disorder is dangerous, and easily turns into a Gangrene. The Remedies profitable in this Case, are of Mother of Time and Henbane, which abate the Pains, but by allaying of the Symptoms the Disease is not removed, therefore we must have recourse to Alteratives: As the Alterative Decoction with Water of the Water-lilly, Houseleek, Lettice, Syrup of *Nympha*, *Species Diatrion*, *Santalum*. The *Antihellicum*, *Poterii*, and Crystals Mineral of Lead: Externally a Cerecloth of Sanders, Roses, and Sugar of Lead is Convenient.

Take the Alterative Decoction, Syrup of *Nympha*, of each 3ij. The Philosophical Spirit of Vitriol 6 Drops, for an *Haustus*,

or an Emulsion made of Houseleek Water, and the 4 great cold Seeds, to which add the *Antihæsticum Poterii* a Dram, and sweeten with Syrup of Water-lillies. Or, Take Tincture of Roses and Vitriolick Spirit of Venus, and outwardly apply Oil of Roses and Henbane, and drink a Decoction of Lettuce and Navel-wort a Handful, Water-lilly Flowers zij . boiled in Milk, to which may be added half an Handful of Henbane, which is very powerful both to abate the Pain, and allay the Inflammation.

In a *Scirrhus* of the Womb it is proper to expel the gross sæculent Humours, by internal aperitive Specificks, especially those from black *Hellebore* and *Sal Armoniack*, and externally Plaster, and Ointment of Hemlock. Take Pills of Gum Ammoniack ʒj . Extract of black Hellebore, Resin of Jalap, and *Sal Armoniack*, of each 6 gr. make into Pills, with the *Fæcula Brionie*. Take Balm a Handful, Flowers of Motherwort, and tops of Mugwort, of each 3, Roots of Briony, black Hellebore, of each one Ounce, Polipody $\text{ʒ}\text{ij}$. Leaves of *Sena* zvi . Roots of Jalap $\text{ʒ}\text{ss}$. *Cassia Lignea* zii . Salt of Tartar $\text{ʒ}\text{ss}$. put them into a Bag for a Diet-Drink, in Water or New Ale, unhopp'd. Take *Fabricius Hildanus's* Plaster of Hemlock, Malax it with Oil of Henbane, and apply to the Womb, or use a Liniment made of Ointment of Hemlock, and Oil of Henbane.

In relation to the Dropsie of the Womb there is a remarkable History of a Woman of *Strasburgh*, who carry'd a swell'd distended Belly above ten Years, and at last was afflicted with a Dropsie, and 70 Moles in the Womb. Corroborating Hydragogues are serviceable to strengthen the Womb; as the Essence and Extract of *Elaterium*, Gum *Galbanum*, *Ammoniacum*, and *Mynsicht's* Hydragogue Extract and Syrup. *Rhumelin's* Instrument mentioned before is of use to carry off the Water from the Womb: For your Catharticks take the following Forms. Take Extract of *Elaterium* 10 gr. Resin of Jalap 6 gr. *Gutta Gamboge* 3 gr. Balsam of Peru *qs*. make into Pills. Or, Take Extract of the Roots of Spurge 12 gr. *Gutta Gamboge* 5 gr. *Galban*. Colatur *qs*. make into Pills. Or if you would purge by Urine, take Salt of Tartar ʒj . Salt of Broom and Scurvy-grass, of each two Drams; Tartar *Vitriolat*.

ʒj . *Sal Armoniack* ʒj . Crab's Eyes $\text{ʒ}\text{ss}$. Mix all for Powders, whereof give a Dram twice a Day, drinking after each Dose one Ounce of Juice of Briony in a Glass of white Wine: Externally may be apply'd a Cataplasim of Goat's Dung, with Oil of Elder.

In the *Prolapsus Uteri* or Descent of the Womb, all emollient and lubricating Medicines are useful; but above all things, the fumigation of a salted Snake's Skin is to be prefer'd: Astringents are to be apply'd last of all, when the Womb is restored to its proper Place; for this purpose a Decoction of Alum, and that of unripe Sloes and *Acacia* are used to fume withal. Externally the Ointment call'd the Countess's, the Styptick Plaster of *Crollius*, and a fumigation of Cow's Dung: Before replacing of the Womb the Bowels are to be loosn'd, afterwards astringent Baths are of Service. But since Wind is often troublesome, and the Body is Bound, this or the like Clyster may be given. Take of the Herbs for a common Emollient Carminative Decoction two Handfuls, Bayleaves half a Handful, Cummin Seeds half an Ounce, boil in Water, and in 6 or 8 Ounces of strained Liquor, dissolve an Ounce of Lenitive Electuary, and that of Bayberries $\text{ʒ}\text{ss}$. and one Yelk of an Egg. Take Plantane, Rupture-wort, Comfry, Bistort, Tormential, of each a Handful, Alum one Ounce, put them in a Bag, boil 'em in Water, and apply them hot to the Womb. Likewise you may apply to the Part Plaster *ad Herniam*, or against Ruptures one Ounce and half *Croc. Martis Astringens* zij . Bear's Grease *qs*. make a Plaster. Or, Take the Countess's Ointment zvi . *Croc. Martis* *Altr.* zij . Oil of Maltick *qs*. for a Liniment; so the Magnetick Ointment hath been much used by many eminent Authors.

For *Weakness of the Womb*. Take Nutmegs in Powder, Mother of Pearl, of each $\text{ʒ}\text{ss}$. Mace, Saffron, of each ʒj . Bezoar $\text{ʒ}\text{ss}$. make them into Powder, whereof take a Scruple in Balm Water $\text{ʒ}\text{ij}$. *Aq. Mirabilis*, and Juice of *Kermes*, of each half an Ounce, Take Conserve of Balm, Rosemary, and Sage-flowers, of each one Ounce, Nutmegs in Powder zij . Mother of Pearl four Scruples, Ivory without burning zij . Spirit of Balm ʒj . Syrup of *Kermes* *qs*. Make an Electuary,

to be taken the size of a Nutmeg twice a Day, drink after it two or three Spoonfuls of the following mixture. Take of white Briony Water, Mugwort, Sage, Balm, of each ʒj. Mother of Pearl, ʒiβ. Coral, Red and White ʒi. sweeten with *Manus Christi* pearl'd.

In *Pain of the Uterus*, if it is grievous, and Anodynes do not answer, you proceed to Narcoticks, not neglecting necessary Evacuation, such as is used in Hysterick and Cholick Pains, after which Fomentations and Inunctions are of greater use, especially those of the emollient Kind, as Roots of Mallows, *Althea*, white Lilies, &c. Take white Agarick one Dram and a half, *Mechoacum* two Drams, Roots of Briony one Dram and a half; Infuse in Balm Water and White-wine four Ounces all Night, then add Syrup of Balm three Drams, of

Cinamon two Drams, for a purging Potion. Or, Take Pills of *Hieracum Agarico* one Scruple, Resin of Jalap 6 gr. Scammony sulphurated 4 gr. make into Pills, with the uterine Elixir of *Crollius*: Or, Take the Catholick purging Powder a Scruple, *Facula* of Briony 12 gr. Oil of Cloves one Drop mix for a Powder. Take Mugwort, Camomil Flowers, of each a Handful, *Lorage* Roots half an Ounce, Bayberries one Ounce; make into a Powder, whereof give a Dram, after which drink this *Haustus*. Take Briony Water compound six Drams, extract of *Opium* 1 gr. Magistery of Pearl 6 gr. Syrup of Cinamon two Drams, mix'd for a Draught, or for a *Bole* give Conserve of Balm or Rosemary Flowers one Dram, *Laud. Opiatum* 1 gr. or two, give at Bed-time.

Of the Suppression or Stoppage of the Terms, discolouring with the inordinate or too great Flux thereof.

THE Cure of this Disease consists in Bleeding after 3 or 4 Days Purging, and that a little before the accusom'd time of Evacuation: And as to Bleeding we ought to have regard to Cupping, especially in the remote Parts first, and then in the Hips and Thighs: And during this whole time of Purgation to observe Ligatures and Friction, or Rubbing: As to Internals we must principally take care of the Tone of the Stomach and Intestines, by which means we must come to correct the Blood by the Aromaticks and Volatile Salts, to let us add Specificks to excite the Menstrual Fermentation: Take your Emeticks from Antimony, which is admirable good in the beginning of the Suppression to discharge the Morbifick Matter of the Stomach.

The following Digestive Powder may precede Purgation. Take of the *Arcanum duplicatum* half a Dram, *Crocus Martis Aperitivus* two Scruples, Salt of Tartar half a Scruple, and make a Powder for three Doses. A Physical Wine may be pre-

pared with cool Herbs, as those of Scurvy-grass, Water-cresses, Celendine, Fumitory, Centaury, of each one Pugil, Raisins one Ounce, Saffron and Cinamon, of each one Dram. For Catharticks take of the *Fætid* Pill one Dram, *Gum Ammoniac* dissolv'd in Vinegar of *Squills* half a Dram, Extract of *Troches* of *Albandal* 3 Grains, with a sufficient quantity of Oil of Amber make into Pills. Or, Take of the Pills of *Hieracum Agarico* one Scruple, *Mercurius Dulcis*, well prepared 15 gr. Extract of Castor enough to form 'em into Pills: The Body being prepared and purged, Bleeding is then very good; for *Lindanus* observes rightly that when the Menses comes on, you ought to bleed in the Arm, and when they Flow, but slenderly or stop suddenly then to bleed with Cupping-glasses on the Thigh, or in the Feet, with the Lancet.

Take the *Arcanum Duplicatum* four Scruples, Castor half a Dram, Myrrh one Scruple, Mace and Saffron, of each half a Scruple; make a Powder, whereof give half a Dram in the following Vehicle for

for a Dose. Take Mugwort Water Compound three Ounces. Cinamon Water one Ounce, an Oxes Gall half an Ounce, Syrup of Cinamon six Drams for a Potion. Or, Take round Birthwort half a Dram, Leaves of dry'd Savine one Dram and a half, *Distamny* of Crete, and Troches of Myrrh, of each one Dram; choice Cinamon two Drams, white Sugar two Ounces, make a Powder which is excellent for the stoppage of the Courses, whereof take two Drams in a Draught of good Chicken Broth wherein is boild some Cinamon, Mace, and Saffron. Take the Extract of Bayberries, Savine, Centaury, and Marygold, of each one Ounce; Salt of Balm and Savine, of each half an Ounce, *Borax* one Ounce and a half, Saffron two Drams, of the *Pil. Aloe-phangina* one Ounce; make a Mass of Pills, with Oil of Cloves and a little Cinamon, of this give one Scruple, Night and Morning. Take of old Venice-Treacle five Ounces, Myrrh two Ounces and a half, Saffron and Cinamon, of each one Dram, Camphire two Drams, pour thereon very good Spirit of Wine three Fingers High, extract a Tincture over a gentle Heat, which being pour'd off by Inclination, add thereto a sixth part of Spirit of Tartar: The Dose is a Spoonful in Wine or Mugwort Water.

Take of Aloes Succotrine six Drams, choice Myrrh two Drams, extract of *Calamus Aromaticus*, and *Carduus Benedictus*, of each one Scruple, extract of Gentian Root, Long Birthwort, and *Distamny*, of each 5 gr. Saffron 10 gr. *Borax* 18 gr. Oil of Amber 8 Drops, *Pulp* of Elder sufficient to make a Mass of Pills; the Dose is a Dram Night and Morning for some Time, drinking after a few Spoonfuls of Hysterick Water. Take Sun dew, Aniseed, of each half an Ounce, *Distamny* and Castor, of each one Dram, Saffron half a Dram, bruise and boil them in White-wine, to which add Spirit of Hart-horn and Amber of each one Scruple, and give it to drink in the Morning Fasting. Take of the *Fetid Pill* one Dram, *Gum Sagapene* dissolv'd in Vinegar, Myrrh, and Volatile *Sal Armoniac*, of each half a Dram, Tartar *Vitriolate*, Saffron and Castor, of each 15 gr. extract of Gentian, Savine, of each half a Scruple, black Hellebore one Scruple, distill'd

Oil of Mace, and Mint, of each four Drops, make into Pills.

The *Discolouration* of the *Menses* is either when they incline to a Whiteness, from the Pituite and Imbecility of the Ventricle, or it may proceed from a *Pus*, and then Ulcers are lodg'd in the *Uterus*, from whence Matter will follow; or else it happens when the *Menses* give a yellow or greenish Cast, which proceeds from the *Bile*; otherwise the Colour becomes Livid, of a dark Purple, from adust melancholy Blood; in these cases *Mercurius Dulcis* mix'd with proper Catharticks are most Efficacious; as Aloes Rotated two Scruples, *Mercurius Dulcis* one Scruple, Oil of Savine 3 Drops, *Elixir proprietatis* 20 Drops, to form 'em into Pills. Or, Take *Scordium* Balm, Centaury Flowers, of each one Handful, Briony Roots one Ounce, black Hellebore prepared one Dram and a half, choice *Sena* one Ounce, Salt of Mugwort two Drams, reduce these into Powder, and give a Dram thereof 3 times a Day; and in order to promote Sweat, Take Harts-horn powder'd one Scruple, Rasplings of Human Skull half a Scruple, *Bezoar Jovis* 12 gr. mix for a Powder. Or, Take *Antihæclicum Poterij* 15 gr. *Antimony*, *Diaphoretick* one Scruple, *tacula* of Briony 4 gr. Mix.

The Cure of the immoderate or disorderly Flux of the *Menses* consists, first in allaying or calming the extraordinary Fermentation and Effervescence of the Blood, and to reduce it by a gentle Coagulation; secondly, to thicken and encrassate, and to coagulate in some manner the too fluidness of the Blood; thirdly, to Contract, restrain and strengthen the Vessels that are too much Relaxed, by Astringents. The Rules already given to proceed by general Methods or Medicines in this case are False; for the bleeding commonly used rather increases the Flux, and the Purgatives irritate and augment the Fermentation. Therefore it is better to follow these or the like Prescriptions.

Take Spicknard Flowers, Dragon's Blood, of each in fine Powder one Scruple, Plantane Water, and Roses, of each one Ounce and a half, make a Julep to be taken by Spoonfuls, to stop the Flux. Or, Take Tincture of red Coral 20 Drops, Syrup of white

white Poppies one Ounce, add this to the former Julep. Take Tormentil Root and Bistort, Plantane Seeds, of each one Dram, red Coral prepared, *Lemnian Earth*, of each two Scruples, Camphire and Balauſtian Flowers, of each half a Scruple, Sugar of Lead 16 gr. make a Powder, divide into eight Parts, whereof take one at a time in a Glaſs of Claret.

Take red Coral prepared, yellow Amber, Bole, Dragon's Blood, of each two Drams, Plantane Seeds, *Borax* calcined, of each one Dram, *Laudanum* ſolid 4 gr. extract of *Crocus Martis Aſtringens* one Scruple, Syrup of dry'd Roſes ſufficient to make an Eleſtuary, with which many have been cured, after 3 or 4 Years Flux, ſaith *Hilaire*. Take of old Conſerve of Roſes ſix Ounces, *Diagdoniatum* without the Species three Drams, red Coral, Dragon's Blood, Human Bones calcined, of each one Dram, Troches of *Karabe*, *Crude Alum*, Plantane Seed, of each two Scruples, *Laudanum ſolid* 6 gr. Syrup of Cinamon, enough to make an Eleſtuary. This given 3 times a Day will cure obſtinate *Hemorrhagies* of the Womb, even af-

ter Abortion, after other Methods have failed.

Take Frankincenſe, Maſtich, Amber, of each two Drams and a half, *Benjamin*, Nutmegs, *Myrtle* and *Laudanum*, of each one Dram, red Roſes and *Balaſtians*, of each a Dram, Mucilage of *Gum Tragacanth* made with Roſe-water, what ſuffices to form 'em into Troches to ſume the Privy Parts therewith. Take a Pugil of Sympathetick Powder, diſſolve it in warm Water, and put therein a Rag dip'd in the Patient's Blood. This Remedy is ſafe, and frequently ſucceeds, not only in an ordinary Flux of the Womb, but likewise after Abortions. Take of the Patient's Blood that is pure, without any mixture of Urine, put it to dry in a Shovel, red Hot, over the Fire, and give the weight of a Crown Piece hereof to the Patient to drink in Claret: Repeat it 3 times and the Flux will ſtop. The Juice of Plantane, or Plantane bruised and apply'd upon the Breasts, or to the genital Parts, with a little Vinegar, will put a check to the Flux from the Womb: So Frog-spawn Water mix'd with Vinegar will do the ſame thing.

Of the Suffocation of the Womb, or Hyſterick Fits, with the Whites or Gonorrhea, and the Greenſickneſs.

THE Cure of *Hyſterick Fits* conſiſts in correcting and altering the Morbiſick Acid of the Intestines to hinder the generation or breeding of Wind, and to allay and quiet the unruly Motions of the Spirits, and the Convulſions that ſucceed them; which is done by Lixivate Salts, Volatile, ſpirituous and oily Medicines. We are firſt to have reſpect to the time of the Paroxiſm, by application of Fætid to the Noſtrils; as the Feathers of Wild Fowls burnt under the Noſe of the Patient, the Hoofs of Horſes, Snake Skins, and the like Volatile Fumes; as *Aſſaſetida*, Oil of Tartar and Amber; in the next place by Ligatures and rubbing of the lower Region of the Belly, and applying of diſcuſſing Clyſters to expel Wind, and Cupping-glaſſes to the Thighs, and ſometimes the very Groins; ſometimes by

putting Sweets up the *Pudenda*, as Civet, Oil of Nutmegs, &c. Internally, by giving of the Volatile Salt of Amber, and Harts-horn, with Powder of Walnut Flowers, Raſpings of Human Scull, Caſtor, and the like, in Pennyroyal, Treacle-water, &c. Externally apply a Plaiſter made of Motherwort, in Beef Suet, or boil'd in Freſh Butter, to which add *Gum Tacamahaca*, and *Carranna*.

Out of the Fits *Purgatives* are to be adminiſtered, with ſome Hiſterical Specificks; *Pil. Fætida* one Scruple, Scammony ſulphurated, Reſin of Jalap, of each 6 gr. Oil of Amber, extract of Caſtor, of each 4 gr. make into Pills, with Ballam of Peru. Or, Take *Pil. Stomach. cum Gummiſ* one Scruple, *Digridii* 10 gr. *Galban. Ammoniac*, of each a Scruple and a half, make into Pills, with
Balsam

Balsam of Amber, or that of Sulphur, with Oil of Turpentine. After this may be used the following Forms; Take extract of Castor and Saffron, of each 12 gr. Mother of Pearls one Scruple, Oil of Angelica, Aniseed, and Amber, of each two Drops, Take them in Cinamon Water half an Ounce, Radish Water two Ounces, Tincture of Saffron a Dram, *Laudanum* Liquid twenty Drops, make a Potion.

Take Pennyroyal Leaves, Mint, and Rue, of each two Handfuls, Lavender Flowers two Pugils, Lovage Seed and Bayberries, of each half an Ounce, Myrrh two Drams, Nutmegs one Dram, white Wine 3 Pints, infuse all for four Hours in *Balneo Maria*, and then distill. Take of this Antihysterick Water two Ounces, Citron Peel one Ounce, Treacle six Drams, Spirits of *Sal Armoniac* one Scruple, Tincture of Castor one Dram, Oil of Amber four Drops, Syrup of Mugwort six Drams, make a mixture, whereof take a Spoonful or two from time to time as occasion serves. Take Pæony and Briony Roots, Orange Peels, of each three Ounces, Leaves of Mugwort, Motherwort, Balm, Pennyroyal, Rue, Savine, and Elder Flowers, of each a Handful, Myrrh and Castor, of each half an Ounce, Saffron two Drams, Macerate in *Spanish Wine* 24 Hours, Walnut and Orange Flower Water, of each a Quart; make a Distillation in a moderate sand Heat, and use it in Hysterick and other Uterine Cases, from a Spoonful to two or three.

A Spirit against Vapours and Suffocation of the Womb. Take long and round Birthwort, Pæony and Valerian Roots, of each two Ounces, of Castor one Ounce, dry'd tops of Wormwood, Mugwort, Tansie, Motherwort, Elder Flowers, and Camomil, of each a Handful, cut and bruise them, and having infused them 3 Days in 3 Pints of Spirit of Wine rectified, distil in *Balneo Maria*, according to Art. Give two or three Drams of this at a time in any Hysterick Water or Decoction; or else apply it singly up the Nostrils, or rub the Temples and Navel therewith.

An Elixir for the same purpose. Take the Chymical Oil of Wormwood, Hyssop, Pennyroyal, Motherwort, Rue, Amber, and Savine, of each a half Scruple, Tin-

cture of Saffron and Castor, of each two Ounces, white Sugar, Mugwort, and Elder Flower Water, of each four Ounces, make an Elixir according to Art, by Digestion, Filtration, &c. and give thereof from half a Spoonful to two Spoonfuls, a little before or after the Fits.

Take *Affasarida*, the Juice of Mugwort and Tansie, of each half an Ounce, Rue in Powder four Ounces, Castor half an Ounce, Saffron two Drams, *Olibanum* and Myrrh, of each two Ounces, Oil of Savine six Drams, Balsam of *Peru* three Drams, Linseed Oil one Pound. Dry the Rue in the Shade, then powder it, and mix with the Juices. Powder the *Olibanum* and Myrrh, and mix 'em with the Balsam, and the Castor and Saffron together, with the Oil of Savine, after this mix by degrees the Linseed Oil with the Juices, till all be reduced into a Liquid Consistence. Put the whole Composition in a Cucurbit well stop'd, and set it to digest in Horse Dung for 5 or 6 Days, after which put it into a Retort luted, and proceed to Distillation as Art directs; preserving carefully in a Vial well stop'd, the Oil that flows from thence, it being singular for Suffocations, if the Umbilical Region be anointed therewith Night and Morning. Or, Take Oil of Castor two Drams, Oil of Amber one Dram, Spike half a Dram, Camphire half a Scruple, or of the Oil 6 Drops. Mix together, and anoint the Region of the Navel with it as before directed.

Take Magistery, or Bezoar of Tin, Mother of Pearl, red Coral prepared, of each one Dram, rectified Oil of Amber one Scruple; mix together, and grind to a subtle Powder, which keep for use. This cannot receive too great an Encomium for the present relief it gives in the most violent and desperate Suffocations of the *Matrix*, and preventing their return you may give one Scruple, in some Hysterick Water during the height of the Fit; and repeat the same 3 or 4 Mornings afterwards fasting, to preserve the Patient from any Return.

Take Pennyroyal Water two Ounces, Swallow Water with Castor one Ounce, Elderberries three Drams, Spirit of *Sal Armoniac* one Dram, *Laudanum* solid and Camphore, of each 3 gr. Syrup of Orange Peels

fix

six Drams; make a Potion to prevent the return of the *Paroxysm*, after which repeat it for a considerable time together, till there appears no Symptoms of a Relapse: There are preservative Pills to be made of Briony, Castor, *Affasatida*, Volatile *Sal Armoniack*, Camphire, and Powder of the After-birth, or a Spirit made thereof by Fermentation and Putrefaction, is a very good Specifick.

For an *Hysterick Clyster* to be administred in the Fit; Take of Angelica Root one Ounce, Fennil Roots half an Ounce, Leaves of Motherwort, and Lovage, of each an Handful, Camomil Flowers two Handfuls, of the four hot Seeds, of each one Dram, boil all in a due quantity of Water; add to nine Ounces of strained Liquor, Ele-ctuary of Bayberries four Drams, Castor

one Dram, the distill'd Oils of Cummin, Carui, and Amber, of each one Scruple; make a Clyster.

For a *Sneezing Powder*. Take of Castor one Scruple, long Pepper 15 gr. white Hellebore half a Scruple, Pellitory of the Wall 6 gr. let this be thrust up the Nose to make the Hysterick Patient Vomit. For a Balsam, Take the Tears of *Affasatida*, *Galbanum*, *Opoponax*, *Sagapenum*, and *Ammoniac*, of each one Dram, distill'd Oil of Rue, Amber, and Juniper Berries, of each one Scruple; make the Gums run in a hot Water, and mix the Oils so as to make a solid Balsam, which keep for use. This is very proper to abate the Vapours, being put up the Nose; and to provoke the Terms by anointing the Navel and bottom of the Belly therewith.

Of the Fluor albus and Gonorrhea.

THE Cure of the *Fluor albus* or Whites in Women depends upon these five things. First, Bloodletting is to be avoided, because of the *Cacoehymia*. Secondly, Discussion is best perform'd by Decoctions of the drying Woods; as *Guajacum*, *China*, *Lentisk Wood*, &c. Thirdly; We are to have regard to a dry Diet, and a thin Air. Fourthly, We are to institute Astringents and Corroborating Medicines. And Fifthly, Much Sleep is to be prevented, especially lying upon the Back, which adds to the Inflammation of the *Lumbares*. If this Disease arise from any other Part besides the Womb, we must direct the Cure to that Part; but let it proceed from what Cause soever, the Chalybeate or Vitriolick Mineral Waters are always useful. Hot Baths are to be shun'd, and Cold Baths instituted in their stead, as of the greatest Consideration in this Case. The Cure of this as well as the simple *Gonorrhea* consists in correcting the poisonous Acid, by appropriate Remedies, and giving a proper Tone to the Parts which are too much relaxed by their Acrimony.

Proper Remedies for the *Whites* and *Gonorrhea* are as follows: First, Take the

Juice of a Lemon, a little fine Turpentine, and as much Camphire, the white of an Egg, dissolve all in a little Rose or Plantane Water, and sweeten with double refin'd Sugar: Drink this as a Potion for 4 or 5 Days, in the *Fluor albus*. Or, Take dry'd Mint three Drams, Orrice Roots, and Rue, of each a Dram, Lettuce and Poppy Seeds, of each half a Dram, white Sugar one Ounce; make a Powder, and take half an Ounce of it in any Chalybeate Waters 3 Pints; or take the following Confection with the Waters, as Pine Nuts, Cucumber and Gourd Seeds blanch'd, Raisins, of each half an Ounce, Cinamon, Mace, Seeds of *Agnus Castus*, of each one Ounce, Camphire one Dram, *Japan Earth* two Scruples; make a Confection with Sugar, whereof take half an Ounce every Morning with the Mineral Waters for 3 Weeks. Or, Take extract of *Tormentil* two Scruples, Powder of Frogspawn, *Agnus Castus*, and Plantane Seed, of each one Scruple, Turpentine boil'd half a Dram, Camphire 12 gr. for a Dose of Pills, to be taken as the former Prescriptions; or Pills made with *Gum Arabick*, *Tragacanth*, *Bole*, Powder of *Myrtles*, and Turpentine, of each equal Parts, with

with Syrup of dry'd Roses qf. or make an Opiate of the 4 cold Seeds blanch'd, *Acacia*, red Coral, Pearl, of each one Dram, white and red Ben, of each 2 Scruples; Opium 1 Scruple; make an Opiate with Syrup of Myrtle, whereof give the quantity of a Nutmeg at Bed-time

In a Virulent *Gonorrhœa*, or that attended with a sharpness of Urine, and heat of the Loins, after due bleeding and repeating as occasion requires, give for some Days the following Emulsions. Take Melon Seeds, *Agnus Castus*, of each 2 Ounces, white and red Poppy Seeds, of each 1 Dram, Purslane, Cinnamon Water, with Barley, of each 18 Ounces, to which add Nitre fixed with Antimony 1 Dram, Antimony, Diaphoretick 2 Drams, sweeten with Tablets of *Mannus Christi* pearled. Take of the 4 cold Seeds 6 Drams, white Poppy Seed 2 Drams, sweet Almonds half an Ounce, Barley Water half a Pound, Lettuce and Water Lilly Water, of each 2 Ounces; Rose Water 1 Ounce; make an Emulsion, to which add sweet Spirit 1 Dram, Syrup of Violets 2 Ounces.

The Humours being tempered and sweetened by this means from their Sharpness, it will be necessary to purge the Patient, for which purpose we make use of Pills made of Turpentine, Rhubarb, or those of Fumitory and Turpentine, with *Mercurius Dulcis*; or else make a Bolus with Turpentine, of *Cyprus*, or *Chio*, Rhubarb and *Mercurius Dulcis*, or some other things; as *Troches*, *Albandal*, or extract of black Hellebore, if we are jealous of any Venereal Virulency.

Take *Cassia* extracted 1 Ounce, Rhubarb and Cream of Tartar, of each 1 Dram, *Diagridium* 4 gr. make a Bolus. Take of Tamarinds 2 Ounces, boil in two quarts of White-wine to a consumption of a third part; add to the strained of clean *Sena*, Liquorice, red Rose and Coriander Seeds, of each 2 Drams, after an infusion all Night, give this to the Patient three Days together, and Night and Morning give a Bolus of 3 Drams of Turpentine, and a Dram of Rhubarb, with a little Sugar.

An Apozem in the *Fluxus albus* or *Gonorrhœa*. Take Comfrey 1 Ounce, Horsetail, Daisies, Knotgrass, of each a Handful, Sorrel a Handful and half, Seeds of Plantane and Mallovs, of each half an Ounce, red

Roses one Pugil, Liquorice 3 Drams; boil all in a sufficient quantity of Plantane Water to half; when cool add Syrup of Purslane and Myrtles, of each 1 Ounce and a half.

Pills for the same use. Take *Venice Turpentine* 4 Ounces, Salt of Amber half an Ounce, extract of Juniperberries, made with Flegm of Alum 1 Ounce, Bole and *Terra Sigillata* prepared as the Juniper, of each 2 Ounces, extract of *Balaustians*, made with an Acid Spirit; Orice Root, and *Agnus Castus* Seed, of each 2 Drams, Dragon's Blood half an Ounce, Rhubarb 1 Ounce, *Crocus Maris Afringens* half an Ounce, Camphire dissolved in Chalybeate Water 2 Drams, boil half the Turpentine in an Earthen Pan, with Plantane Water and White-wine, till they are consumed away; then add to the Turpentine the other Drugs, and form them into a Mass of Pills, which keep in an oiled Bladder with Care: They Deterge, Agglutinate, dry and sweeten at the same time, and are singularly good in the Whites, and to stop the *Gonorrhœa*, being taken 6 or 8 about the size of a Pea, in the Morning, three Hours before Eating, and continued for the space of 8 Days.

Take of Bistort Root, Tormentil, and Water Lilly, Ivyberries, Lettuce Seed, Rue, *Agnus Castus*, Amber, Maltick, *Olibanum*, Dragon's Blood, Nutmeg, of each half an Ounce, *Venice Treacle*, enough to form into Pills, which are very much valued to stop a *Gonorrhœa*, when it is proper to be check'd, taken Morning and Evening for several Days.

Take of dry Mint 3 Ounces, of Lettuce Seed, Rue, *Agnus Castus*, of each 2 Ounces and a half, of Orice 2 Ounces, Distamny, of *Crete* 6 Drams, white Sugar half a Pound, powder the whole, and having mix'd them in a Glais Retort, add *Venice Turpentine* 5 Ounces, White-wine a Quart, then distil in a Sand Furnace. The Dose is two Spoonfuls an hour or two before Dinner, this Water is very Efficacious, to stop an inveterate Running after Universal Medicines, and specifick Purgatives have preceded.

To make the Medicinal Stone Powder, mix together red *Colcothar* of Vitriol, that remains in the Retort after Distillation;

or for want of that Calcine to a redness, 2 Ounces of *Litharge*, of Alum and Bole, of each 4 Ounces; mix them together in a glased Pot, and pour upon them good Vinegar till it over-top two Fingers breadth, stop the Pot, and leave it in Digestion two Days; then add Nitre 8 Ounces, *Sal Armoniac* 2 Ounces, put the Pot upon the Fire, and consume away the Moisture. Calcine the Mass that remains about an Hour over a great Fire, and keep it for Use. This is a good Medicine to stop the *Gonorrhœa*, dissolving a Dram in about 8 Ounces of Plantane or Smith's Forge Water, to make an injection into the Yard: It is likewise good for the Eyes, in the Small Pox, 7 or 8 Grains being dissolv'd in 4 Ounces of Plantane or Eye-bright Water, for a Colliry: It is proper to stop Blood, apply'd externally upon a Wound.

This Injection which follows is excellent for Ulcers of the *Urethra*. Take of Goat's Milk 6 Ounces, Plantane and Rose Water, of each 7 Ounces, of Ceruse 6 Drams, *Spodium* powder'd, Crystal, Roch Alum, of each half a Dram, and make an Injection. Take good Wine, and Plantane Water, of each 2 Ounces, Sugar of Lead 1 Scruple, Camphire 12 gr. 'Tis a sure Remedy against Inflammations and Tumours of the Glans and Prepuce. Take New Cow's Milk what quantity you please, Elder and Rose Flowers, of each a Handful, boil them, and then add to the strain'd Liquor Sugar of Lead 8 Grains. The cooling Ointment of *Galen*, and that of Tutty are proper for Ulcers of the Prepuce.

Cataplasms made of Barley or Bran Flower, Cummin Seed, Camomil Flowers, and Melilot, powder of Roses and Oxyemel are good against Tumours of the *Scrotum*. Take Turbith Mineral, red Precipitate, mix 'em with some Mugwort, and apply upon a Wax Candle into the *Urethra*, to take away the Carnosity or Caruncles thereof. Or, Take Oil of Roses and Ceruse, of each one Dram, of Tutty prepared half an Ounce, Camphire 2 Drams, of Aloes, Male Frankincense and Myrrh, of each 2 Scruples, Tallow half an Ounce, make an Ointment without Fire, because of the Camphire burning, by beating in a Leaden Mortar,

this will consume the Carnosity, being apply'd with the Candle.

But above all Remedies the Water drawn by Distillation from *Acorus*, and impregnated with its fix'd Salt, is the most incomparable, not only to stop a *Gonorrhœa*, but likewise the Whites, and excess of Menstrual Purgations. The Roots of *Filipendula*, or the Bark of the Root of the Mulberry Tree a Dram, given in Claret stops the Whites and Courses, more effectually than *Crocus Martis Astringens*. Take the same of Plantane a Glass, *Colophony* in Powder, make a Potion, which repeat 3 times or more; likewise the Juice of Yarrow 3 Ounces, given in Syrup of Coral is very Efficacious. Take Roots of Tormentil and Bistort, Plantane Seed, of each a Dram, red Coral prepared, Seal'd Earth, of each 2 Scruples, Sugar of Lead and Camphire, of each half a Scruple, make a Powder, which divide into 6 Parts, of which take one Morning and Night in a Glass of strong Claret.

The *Greensickness* is cured, first of all by Blood-letting, especially in such where the disorder is of a fresh Date, and the Blood not degenerate into another Humour; in the first place if the Suppression arises from Evacuation of the Blood; secondly by Purgation; thirdly from Obstruction, in which regard is to be had to all the *Viscera*, and first to the Suppression of the *Menses*. In Diet we are to avoid the *Acid*, and in *Catharticks* always have consideration for Digestive and Aperitive Medicines; several forms whereof follow. Take *Crocus Martis Aperit.* half an Ounce, Salt of Succory and Ash Keys, of each 1 Dram. The *Fecula* of Briony 2 Scruples, make a Powder, and give from a Scruple to half a Dram. Or, Take Tartar Vitriolate 1 Dram, Salt of Scurvy-grass, Succory and Wormwood, of each 1 Scruple, divide into 6 equal Parts. Or, Take Tincture of Steel, of *Mynsicht's*, *Vitriolum Martis* 2 Drams, *Elix. Proprietatis* 3 Drams; mix and give from Forty to Sixty Drops.

If the Patient's Strength will permit, give Purges and Vomits, as *Mynsicht's*, Powder of Jalap 1 Scruple, Troches of *Agarick*, *Crocus Martis* saccharated, of each 12 gr. Or Powder of the Roots of Jalap 1 Scruple,

Vuria-

Viriolum Martis, *Facula* of Briony, Scammony fulphurated, of each 6 gr. Tartar vitriolated half a Scruple, Conserve of Roses *qs.* for a Bolus. Or, Take extract of *Diacarthamum* half a Dram, Scammony 6 gr. Conserve of Balm: Take Pills of *Ammoniac* and Tartar of *Quercetan.* of each half a Dram, Scammony fulphurated 12 gr. *Troches Albandal* 6 gr. make 24 Pills. Or, Take Pills of *Sagapen* 1 Scruple, Resin of Jalap 6 gr. extract of *Troches Albandal* 4 gr. with Syrup of Steel, make into Pills. Take *Extracte Diacartham.* 1 Scruple, *Troches Albandal* 6 gr. *Crocus Martis* half a Scruple, make into 12 Pills.

Take *Extract. Diacartham.* half a Dram, dissolve in some Aperitive Water, as that of Parsley, Radish, &c. to which add Scammony *Rosat.* 6 gr. Tincture of Steel 1 Dram, Syrup of the 5 Opening Roots 1 Ounce, make a Potion. Or, Take Electuary *Catholicon*, and *Extract. Diacartham.* of each two Scruples, dissolve them in the Aperitive Decoction, and add thereto the Laxative Syrup of Apples. Take the Purging Catholick Powder two Scruples, Rhubarb one Scruple, shake them in 2 Ounces of the Decoction of

the Aperitive Roots, and sweeten with Syrup of Peach Flowers, for a Purging Draught. Take Agrimony, Dodder, Horehound, of each a Handful; Flowers of Borage, Bugloss, Succory, Broom, Liverwort, of each two Pugils, *Monk's Rhubarb* 1 Ounce and a half, Roots of black Hellebore, Fern, of each 1 Ounce, of the 5 opening Roots, of each 2 Drams, Seeds of *Carthamum* 6 Drams, white Agarick 3 Drams, choice Cinamon, *Cassia Lignea*, of each 2 Drams, Cloves 1 Dram and a half, Spice 1 Dram, Salt of Tartar 1 Ounce; make a Bag thereof for a Diet Drink, in Whey, Water, &c. Take white Agarick 2 Drams, Jalap Roots 4 Scruples, sprinkle them over with Tincture of Salt of Tartar, and then infuse all Night in some Aperitive Water or Decoction, and to the strained Liquor add Syrup of Apples Laxative 1 Ounce. This being regularly pursued we are next to have recourse to Restoratives and Strengtheners; as the Cachectick powder of *Quercetan* 2 Drams, Ivory without Fire, *Species Diarrhodon Abbatis*, of each 1 Dram, with Sugar dissolv'd in *Scorzonera* Water, make 'em into Lozenges, which eat frequently.

Of the Furor Uterinus or Womb Melancholy.

THE Cure of this Disease is affected either by Blood-letting, where there is a *Plethora*, or gentle Purging, with cooling Alterative Medicines to temper the heat of the Bile, and discharge the *Serum*. Such as Pills of Fumitory 1 Scruple, Scammony fulphurated 8 gr. Sugar of Lead 4 gr. Or, Take Water of the Water Lilly an Ounce and a half, Syrup of the same half an Ounce, the Catholick purging Powder 2 Scruples, or Syrup of Succory, with Rhubarb one Ounce; Water Lilly Water half an Ounce, Scammony fulphurated 8 gr. Alteratives and Coolers are such as Lettuce, Purslane, Rue, Hemp, Camphire, Hemlock, &c. Take an Emulsion of the 4 cold Seeds, made in Barley Water 4 Ounces, Syrup of Water Lilly an Ounce and a half, Sugar of Lead 1 Scruple, Camphire 8 gr. Dose 2 or 3 Spoonfuls frequently. Take Hempseed 2 Ounces, Let-

tuce and Purslane Seed, of each 2 Drams, with Poppy Water, make an Emulsion, and sweeten with Syrup of Water Lillies. Take Oil of Water Lillies 1 Ounce, Oil of Rue 3 Drams, Sugar of Lead 2 Drams; with this anoint the Reins and Genital Parts. Take Plaister of Hemlock, *qs.* Malax with Oil of Water Lillies, and apply to the Womb in the usual Form.

Where this is attended with *Melancholy*, Bleeding is to be order'd at the beginning, and that often in Bed; if the *Menses* are suppress'd, then Bleed some Days before the Flux is expected, but if otherwise be more sparing in that Evacuation: Such things as alter the Crasis of the Blood and Humours, and refresh and exhilarate the Heart are the most serviceable: As Balm, Borage, Bugloss, Cinamon, Rosemary, Lavender, the Cordial Species, and the like. The Tincture

or Essence of Borage or Balm, taken frequently in any Liquid, not only strengthens the Womb, but comforts the Heart. Take *Species Latificans Galeni* 1 Ounce, Tincture of Balm and Borage, of each half an Ounce, Sugar *qf.* dissolved in Rose Water, made into Lozenges. Or, Take Conserve of Balm 1 Ounce and a half, Conserve of Borage, Marigold Flowers, of each 6 Drams, *Spec. Latif. of Galen* 4 Drams, with Syrup of Orange Peels; make an Electuary, to which add Confect of Hyacinth 5 Scruples.

Such Evacuations as are appropriated to the Womb are always to be used in these Melancholy Cases: As Extract of Hellebore and Briony, of each 1 Scruple, Antimony that purges downwards 6 gr. Conf. of Fumitory *qf.* to make into Pills, for a Dose. Take Extract of black Hellebore 15 gr. Scammony sulphurated 8 gr. Cinamon Water and Borage, of each half an Ounce, Syrup of Apples Laxative 5 Drams, make a purging Potion. Or, Take Extract of black Hellebore half a Scruple, Scammony Rosated 8 gr. The Aperitive Tincture, and that of Steel, of each 1 Scruple, Syrup of Succory 1 Ounce. Take Balm one Handful, Borage, Buglois, and Marygold Flowers, of each 3 Pugils, Roots of Fern an Ounce and a half, black Hellebore 1 Ounce, *Sena* pick'd 1 Ounce, *Cassia Lignea* 3 Drams, Salt of Tartar one Ounce, make a Bag, and put them therein for a Diet Drink, or Physical Wine, to be continued for some time.

Of the Nature and Cause of Barrenness, we have treated in another Place, and therefore shall only propose here some Methods of Cure, which depend in general upon Catharticks, Corroboratives or Alteratives: As to the first in making use of Purgation, the Phlegmagogues are of the greatest use. Take the Phlegmagogue Extract 1 Dram, Refin of Jalap 6 gr. Conserve of Rosemary Flowers; make into Pills. Or, Take *Eryngo* Root 1 Ounce, Rosemary Flowers, Sage, of each 1 Ounce, *Carthamus* Seed, white Agarick, of each 3 Drams, *Seseli* and *Ammeos* Seed, of each 1 Dram, *Cassia Lignea* and Cream of Tartar, of each half an Ounce; make hereof an Alterative Diet-Drink in Ale, Water, Whey, &c. Or, Take Agarick 3 Drams, *Mexicoan* half an Ounce, Rosemary and Sage Flowers, of each

2 Pugils, Cream of Tartar 2 Drams, infuse all Night in White-wine 6 Ounces, to the strained in the Morning add Syrup of *Asarabacca* half an Ounce.

Take Conserve of Rosemary and Sage Flowers, of each half a Dram, the Catholick purging Powder 1 Scruple, Refin of Jalap 4 gr. Syrup of Cinamon *qf.* to make a Bolus.

For Restorative and Corroborating Medicine, Take Rosemary Flowers a Handful, Sage and Lavender, of each half a Handful, *Eryngo* Roots 1 Ounce and a half, Aniseed and *Seseli*, of each 3 Drams, Cinamon and Nutmegs, of each 2 Drams, *Cassia Lignea* 1 Ounce and a half; cut and bruise them so as to make a Confection of them with Sugar, or to infuse them for an Hysterick Wine, whereof the Patient may drink an usual Wine-glass twice a Day. Take the Specifick Decoction of *Quercetan* 6 Drams, Syrup of Coral 3 Drams, Tincture of Sassafras 1 Scruple and a half; mix for a Draught. Take Conserve of Sage & Rosemary Flowers, of each 1 Ounce, Briony Roots Candied 1 Dram, Nutmegs Candied half an Ounce, *Seseli* and *Bishop's seed*, of each 1 Dram and a half, Cloves and Saffron, of each 2 Scruples, with the Juice of *Alkermes*; make an Electuary. Take of this about the quantity of a Nutmeg Morning and Evening: Drinking after it the following Cordial. Take Borage and Balm Water, of each 4 Ounces, Cinamon Water made with Barley 5 Ounces, Rosemary Flower Water 6 Drams, Tincture of Coral and Saffron, of each 2 Drams, *Galen's Species Latificans* 2 Scruples, sweeten with Syrup of Citrons.

Warm Baths are proper for Women in these Melancholy Disorders, especially such as are prepared of the following Herbs and Roots. Take Mercury 3 Handfuls, Marjoram, Sage, Mugwort, Balm, of each 2 Handfuls, Rosemary, Pennyroyal and Motherwort, of each a Handful, Roots of Bistort and Tormentil, of each 4 Ounces, Bay and Juniperberries, of each a Handful; cut and bruise these, then boil them in Spring Water for about an Hour, and let the Patient Bath in the Water and Herbs, as hot as possible, and after coming out of the Bath anoint the lower Region of the Belly with the following Liniment. Take Fox Grease

one Ounce, Oil of Sage and Cinamon Seed, of each one Dram, Oil of Savine one Scruple, Oil of Mace, by Expression four Scruples, Camphire two Scruples, *Sperma Ceti*

two Drams; make a Liniment, wherewith anoint the Loins, Hypogastrium and Umbilical Region.

Of the Diseases incident to Women with Child, and their several Cures. From the same Authors as before.

AMONGST those Symptoms with which breeding Women are afflicted, in the first Months of their Gravitation, the *Cramp in the Legs and Thighs*, is very troublesome, and may be reliev'd by anointing with Oil of Bays, rubbing it in before a warm Fire: Some indeed recommend the Rings of the Sea-Horse-Tooth, likewise Elks Claws: Externally use *Mynschi's* Cramp Ointment 1 Ounce, Oil of Earth-worms half an Ounce: Or, Make a Liniment with Lime-flowers steep'd in Spirit of Earth-worms: Or, Make a Liniment with Oil of Camomil 1 Ounce, Earth-worms half an Ounce, Castor and Oil of Amber, of each 1 Dram; so Venice Treacle with Oil of Scorpions and Castor dissolved in cold Water, which sometimes alone relieve without the addition of any of the Volatiles.

Sciatica Pains.

Anoint with Oil or Spirit of Turpentine; besides which all Arthritick Remedies prevail, as *Hartman's* Gout Balm, &c. So Flowers of Vervain and Mullein boil'd in Ale, and applied with a Cataplasin or Pulvis of Bread, and the white of an Egg, with *Nasturtium*, Pennyroyal, Roots of Briony, stamp'd and made up together; Goat's Dung boil'd in Spirit of Wine, to which add powder of Juniper-berries makes an excellent Cataplasin. Anoint with the Fat of an Hare boil'd in Spirit of Wine, to the Consumption of the Spirit; likewise give Chymical Oils of Juniper, Bayberries, and the Fat of a Dog: Sage, Marjoram, Rue and Thyme, infused warm in Spirit of Wine; so Bags fill'd with Tansie, and boil'd, after which

sprinkle them with Spirit of *Gnajakum* and Rosemary. Take Salt of Tartar and Nitre, of each *℥ss* melt them in a Crucible, to which add Spirit of Wine for an *Epihemum*.

Of Loathing of Meat.

In this Disorder there is no necessity for many Medicines, because it ceases as the *Fetus* grows; but if there be a great occasion take care to avoid Evacuation, and to fortify the Stomach by the *Elixir Vitrioli Mynschi* taken 10 or 12 Drops in Water, or Wine and Water; *Paracelsus's* *Elixir Proprietatis*, the *Confectio Diarrhodon Abbatis* or the like, in two or three Spoonfuls of some Generous Wine, after which let the Patient eat Flesh-meat, as Chicken, Capon, Rabbit, &c. avoid too much Liquids and Fat Things; and to Drink, the dryest and most Astringent red Wines, as *French Claret*. Take Smallage Seed 3 Drams, red Coral 1 Scruple, Spiknard, Long Pepper, of each 3 gr. Honey of Roses *℥ss* make an Electuary to take Fasting, the Size of a Nutmeg; externally anoint the Stomach with Oil of Mint, Wormwood, Quinces, Myrrh, Maltich, &c.

Of Women's Longing.

This is cured three Ways: First by Diet, as Bread Macerated with Juice of Quinces or Pomegranates; by eating bitter Almonds Fasting; after Meat by eating of Grapes, Peaches, Pears, and Filberts, with other grateful Fruits, not too Acid, but beware of Fat and sweet Meats. Secondly by purging gently with Rhubarb, and Conserve of Roses: Likewise easie Vomits agree wonderfully

derfully in this Case, such as Oxymel of Squills 2 or 3 Spoonfuls in some convenient Vehicle, &c. Thirdly by Discussing of Crude Humours that lodge upon the Stomach, for which purpose Orange Chips candied, Citron and such like are agreeable. Take the Powder of both Corals, Hartshorn, rasp'd Ivory, *Margarit*, of each 1 Scruple; make into Lozenges or Troches, with Sugar dissolve in Rose-water, and a little *Gum Tragacanth*, and let the Patient eat a few of these before Meat: Where the Stomach is Languid and wants more Assistance, Take Oil of Nard, Wormwood, and Mint, of each 1 Ounce, Vinegar 1 Ounce and a half, Seeds of *Amicos*, Cummin, powder of *Cardamoms*, and Roots of Capers, of each 1 Dram, boil them to the Consumption of the Vinegar, and with white Wax make a Liniment, to anoint the Region of the Stomach: Some Physicians mightily commend Filings or Rust of Iron, if taken for some time a Dram a Day in a little Conserve of Roses or Wormwood, drinking afterwards a small Glass of good Stomachick Wine.

Of Puking and Vomiting.

This is what ought not to be entirely suppress'd, nor can it easily be done, for it will cease of its own accord in 2 or 3 Months time, tho' some carry it on to the Birth; yet if it be excessive and beyond Bearing, a gentle Vomit is proper at first, and afterwards Evacuation by Stool, with Rhubarb, *Sena* or *Aloes*, according to the Nature of the Case and Constitution of the Patient. When this is done the Ventricle ought to be strengthen'd by Internals, which are Stomachical Specificks, with which the Dispensatories abound, it is serviceable to strew a little Rhubarb, and to use Conserve of Quinces candied, *Myrabolans* and Myrtle-berries, Orange, Lemon, and Citron Peels: A Toast of Bread well baked in a Glass of Claret, or that and Water: Likewise Milk and Water, with Syrup of Woodforrel or Lemons, and Conserve of Roses, externally anoint the Stomach with Oil of Wormwood, Mastick, *Tacamahaca*, or the like; otherwise apply a Plaster to the Stomach, made of *Laudanum*, *Tacamahaca*, of each 2 Drams,

Oil of Mastick and Mint, of each 6 Drops, Balm of *Peru* qf. for a Plaster.

Of the Gripes or Belly-Ach.

This is remedied the same way as the Inflation of the Womb: Regard must be had to Diet, that it be hot and dry, that raw, unripe Fruits be Prohibited: It is likewise good to chew Cinamon, Aniseed, Citron and Orange Peels, the powder of which may be given in Wine, or distill'd Cordial Waters: Fennil Seed eaten with Sugar expells Wind powerful, and the distill'd Oil apply'd to the Navel is of great Use. Or make a Bag to be laid to the Navel of Fennil Seed, Aniseed, Dill steep'd in some Aromatick Wine, or *Aqua Vina*: Clysters may be safely given with the Chimical Oil of Dill, Cummin and Bayberries, together with the Yolk of an Egg in half a Pint of Sack or *Malmsey* Wine: Avoid much unguents and moist Fomentations, which may dilate too much, and procure Abortion; but you may apply Plaisters to the Navel of strain'd *Galbanum*, *Laudanum*, *Tacamahaca*, &c. malax'd with a few Drops of Oil of Cummin, Dill, Fennil, Aniseed, or Balm of *Peru*.

Of Loosness, or a Scouring of the Guts.

A Looseness or white Flux of the Belly is of dangerous Consequence to Women with Child, for fear of Miscarriages; therefore the sooner the better, if it be either *Lienterical* or *Dysenterical*: For in a *Diarrhæa* that proceeds from the abounding of depraved Humours we must beware of Astringents; for though there is danger of Abortion in letting the *Diarrhæa* continue, there is more danger both to the Parent and the *Fetus* in putting a check thereto before the plenitude of Humours be Evacuated, therefore it is the best and safest Method in that Case to have regard to Diet, and a *Regimen* to alter the Habit of the Body by degrees, and change it to a better State.

The *Dysentery* must be cured by good Diet, and Drinks of the best Wines, sometimes Chalybeated; in the next place the Humours must be expell'd by Evacuation, together with corroborating Medicines, as

Syrup

Syrup of Roses, *Myrobalans* and Rhubarb: If the Blood abounds a Vein must be open'd, otherwise the Humours temper'd by cooling Alteratives, &c. of Sorrel, Purslane, Violets, Bugloss, with Rhubarb and Conserve of Roses: During this time the *Fetus* is not to be neglected, but strengthen'd with the Admission of *Diafcoordinum*, Venice Treacle Cinamon; Cloves, &c. If the Flux become *Dysenterick* or *Celiack*, administer the following Opiate. Take Conserve of red Roses 1 Ounce and a half, Bole, red Coral prepared, Troches of *Carabe* and Mastich, of each half a Dram, solid *Laudanum* half a Scruple, give a Dram of this in four Spoonfuls of Cinamon Water, at the same time apply to the Navel a Cataplasim of Quince Seeds boil'd with Nutmeg, Mastich, Mace, Cloves, &c.

own accord, but if it be very troublesome and afflicting we must endeavour to repel it by gentle Means; whereof we have treated under the Diseases of the Head, and shall refer you to that, both in the *Vertigo* as well as this Disease, in the mean time we ought to take notice here if these Vapours or Pains arise from the *Plethora* of the Mother during her Gravitation, and then Blood-letting must be instituted, but if the Disorders arise only from the Stomach, then let 'em take the following Peptick Powders. Take of Coriander Seeds prepared 1 Ounce, Cinamon half an Ounce, Mace 2 Drams, Oil of Nutmegs 4 Drops, Sugar pearl'd 4 Ounces; make a Powder, which may be divided into 20 Papers, one whereof may be taken 3 times a Day.

Of the Tooth-Ach in breeding Women.

Tooth-Ach of which there is no surer a sign of Conception, if from a Flux of Humours is cured by a Blister, or applying a Plaister to the Temples of Mastich, *Tacamahaca*, and Opium: We must mitigate the Pain with Anodyne Pills; there is likewise a Wine to be held in the Mouth, in which Sage, Marjoram, Coriander, and Galls have been boil'd; or a Decoction of Fern, Bistort, red Roses and Sage, or the Vapour thereof drawn into the Mouth. If the Pain proceeds from a cold Cause; Oil of Cloves, Sage, Camphire, Fox, *Origanum* are used, being drop'd into the hollow Tooth, or held in the Mouth with Cotton or Lint, the Teeth are to be rub'd with Pellitory, Pepper or Cloves. If from a hot Cause nothing relieves the Pain sooner than cold Water held in the Mouth, and often Repeated. If from Acrid and Scorbutick Humours, then *Odentalgicks* boil'd in Milk are best; because the Milk tempers the Acrimony, but above all Remedies is Camphire boil'd in Vinegar, and the Liquor held just warm in the Mouth.

Of the Head-Achs and Vertigos.

The Head-Ach in breeding Women tho' the Child grow large, yet will cease of its

Of the Cough in pregnant Women.

When the Abortion is dreaded this Cough is very dangerous, and ought to be maturely considered with all the care imaginable, because the extension of the Diaphragm presses the Fund of the Uterus forcibly downwards: For this end fresh drawn Linseed Oil, and that of Sweet Almonds, with the Mucilage of *Althea* and the like is to be made use of; also the Fumes or Vapours of Decoction of Marjoram, Hyssop, Pennyroyal, Rosemary and Sage are to be received by the Mouth and Nose: At length Pectoral Medicines ought to be exhibited either in Linctus, Lozenges, as the Matter is Hot or Cold, Thin or Thick, avoiding all sweet Things that are too Hot and Glutinous, for they are Enemies to the Womb. The *Species Diuragacanth* frigid, *Diaireos*, the Astmatick Syrup of Garlick, *Paul's* Betony, and *Scabins* are to be used in Decoctions with Oil of Fennil. Take Hyssop a Handful, Nettle Seeds, and Orange Root, of each half an Ounce; make a Tincture, to which add Syrup of Betony, and Syrup of *Squills*, of each 1 Ounce; drink 3 or 4 Spoonfuls of this every hour or two. Take Syrup of Violets, Oil of Sweet Almonds, of each one Ounce and a half, *Carthamum*, Orrice Root in Powder, of each 2 Drams, *Sperma Ceti* 4 Scruples; make a Linctus.

Of the Palpitation of the Heart.

If this proceed from too great plenty of Flood, or a *Lipothymia* in the midst of the time of Gravitation, which is a certain sign of Miscarriage, the best Method is to breath a Vein, and take such quantity of Blood as is most agreeable to the Patient's Constitution, and the Nature of the Symptoms: Some in this case give Rhubarb, with Conserve of Roses, to purge off the Humours. But if the *Syncope* or Palpitation arise from Wind or Vapours; Cordials are to be exhibited, that have power to drive away the Malignant Vapours, as *Bezoar*, with Confect of *Hyacinth* and *Kermes*; Spirits of Lavender, Lilies of the Vally, *Scordium*, with Cinamon Water, Spirit of Balm, &c. Externally make an Unction with Oil of Scorpions, Cinamon, with Venice-Treacle: Let Cordial Bage be apply'd, fill'd with the Cordial Flowers, Yellow Sanders, Angelica, and *Species Diambre*: And anoint the Region of the Heart with Spirit of Lavender, *Sal Armoniac* succinated, of each equal Parts.

Of the Hæmorrhage.

This Symptom is not without Danger; but if the Flux proceed from a plenty of Blood, Blood-letting must be administred, and Adstringents, yet both with Caution: For Example, Take Syrup of Coral and Purslane, of each 6 Drams; Plantane and Comfrey Water, of each 1 Dram; Cinamon Water 6 Drams; Coral prepared 1 Scruple; make a *Haustus*, externally apply the Plaster of *Sanders*, with Oil of Mastich, to the Right Side: Frictions are likewise serviceable, and Cupping upon the Upper Parts. So these following Medicines, Coral, Pearl, Seal'd Earth, Confect of *Hyacinth* and *Alkermes*, with Oil of Cinamon, Cloves, &c. if the *Cachochymia* proceeds from a Serous Acrid Humour, then the Matter is to be Evacuated and Temper'd: And it would be profitable to chew *Rhubarb* it self, or with Conserve of Roses, and other Laxatives; as *Sena*, *Myrobalans*. Take Liquorice, and Succory Roots, of each 2 Drams; Wood-forrel, Agrimony, Endive, of each half a Handful; the Cor-

dial Flowers, of each a Pugil; Aniseed and Fennil, of each 1 Dram; *Sena* 4 Drams; boil them in Balm and Succory Water *qs.* to the strained Liquor 4 Ounces; add *Manna* 1 Ounce; Cream of Tartar 1 Dram: Mix for a Draught. Concerning the use of Astringents we ought to take notice if the Blood is Grumous, and not decay of strength Succeeds, that Nature is sufficient to expel the Enemy, and that then the Flux is not to be stop'd with too great Astringents; but Corroboratives apply'd to strengthen the *Fatus*, and such nourishing Diet as may encrease the growth of the *Embrio*.

Of the Suppression of Urine and Siege.

The first commonly happens from the erect form of the Woman, whereby the Burthen presses upon the Neck of the Bladder, therefore the Woman ought to sit or lye at such times; and have the Region of the Womb fomented with Baths made of Pellitory, Mallows, *Althea*, Parsley Roots, Linseed, and such like. But the Suppression of Siege, and Costiveness of the Body, may be relieved by a Laxative Diet; together with eating of Almonds and Raisins, Prunes, Honey of Roses, &c. so gentle emollient Clysters may be given without Danger; as for Example. Take Barley Water, and Mutton Broth *qs.* Borage Flowers, and Pellitory of the Wall, of each half a Handful; to this add Honey of Roses 1 Ounce; the Yelk of an Egg: Or they may use Emollient Suppositories; but if there be danger in the Suppression of Urine remaining too long, it is safest to provoke it by use of the *Catheter*.

Of the Inflation and Disention of the Veins in the Thighs, Legs, and Feet.

This happens so, that they appear sometimes as if they were varicous from the weakness of the Vessels, and Inflammation together, that relaxes and stretches their Tunicks; but after the Birth, and the Cleanings, they return again to their usual Size: Therefore here is no great use of Medicines, but the Patient ought to take care of necessary

beat up into a Poinatum. Or, Take Mucilage of Linseed, Fennygreeke and *Althea*, of each 6 Drams; extracted in white Lilly Water, and form'd into a Liniment with white Bees Wax. The Wrinkles are to be prevented with Oil of Linseed, Violets, St. *John's* Wort, Tutty, Lytharge, and Lead. Or, Take Oil of Lillies 1 Ounce; Deer's Suet half an Ounce; Camphire and *Sperma Ceti*, of each 1 Dram; make a Liniment of this, which use 4 Months of the latter part of the going with Child.

Of the Suffocation of Water from the Womb.

This Disorder is scarce cured any other Ways than by good Diet, and an exact Regimen or Method of living Temperately, and of the most drying Victuals; abstaining entirely from all Fruits, Raw-Meat, and any kind of moist Provisions: Likewise the Patient must resolve to avoid drinking any more than necessity requires, and that Water with a little Wine, and a Toast of Bread well baked therein. The following Diet-Drink may be of some use, Take Roots of *China* half an Ounce, *Sarsaparilla* 1 Ounce, *Guaiaicum* 3 Drams, Sage a Pugil, boil all in Borage and Comfrey Water 2 Pound; then add Powder of Coral and Crab's Claws, of each half an Ounce; Red Roses in Powder 2 Drams; sweeten with Sugar, and strain it off for use: Of this drink 4 Spoonfuls in the Morning, 4 more Two or Three Hours before Bed-time, abstaining from Meat Suppers during the whole time that this Symptom lasts. Dry Bread, or that well Toasted, with Flesh well Roasted, especially that of Hare and Rabbet, are the best Food.

The Skin of the *Abdomen* is not so stretch'd in the first Conception as it happens afterwards, when it does not only occasion a Deformity, but the Pain is very great in the Extension. To remedy this after the fifth Month, Laxative Liniments and Ointments may be safely us'd; as the Marrow of Veal, Oil of Sweet Almonds, Hen's Grease, and *Sperma Ceti*, wash'd in Rose Water, and

Of the Diseases of Women in Child-bed, &c.

Of Pains before Labour.

THEY are to be eased or cured by internal as well as external Means. Internally may be given Powder of Saffron, *Cassia Ligneæ*, Cinamon, Borax, Amber, &c.

in Balm, Mugwort, Savine, or Birthwort Water. Take *Borax* and *Cassia Lignea*, of each half a Scruple, Saffron 6 gr. Oil of Cinamon 2 Drops: Mix for a Dose. Or, Take Raspings of Ivory 2 Drams, *Cassia Lignea*, Cinamon, Saffron, of each 1 Scruple;
S f f

ple; mix, half a Dram is a Dose, taken twice or thrice every Hour in Cinamon and Pennyroyal Water. Externally may be apply'd Bags to the *Hypogastrick Region* of the *Abdomen*, made of Mallows, Motherwort, Balm, Pennyroyal, Mugwort, Rosemary, Savine, Hyssop, Betony, Camomil Flowers, Melilot, Linseed, Fennugreek, boil them in Wine and Water, squeeze the Bag first, and apply it when it begins to grow Cold, dip in the Liquor to heat it again, and apply as before; or a Sponge may be dip'd in this Decoction and clasp'd to the Part.

Of a Profusion of Blood.

This is to be remedied by Emplastick Medicines, partly Astringent, Acerb, Austere and Acid, both Internal and External; as may be observed in the case of an immoderate Flux of the Menes; so like Cardiacks are to be administred, as in the Palpitation of the Heart: Externally, first make a Ligature upon the Arms and Hands, and Fomentations of the Astringent Herbs, Roots, &c. As Tormentil, Bistort, Cinquefoil, Plantane, Shepherd's Purse, Myrtleberries, Oak-leaves, Sloes, Cypress Nuts, Galls, boil'd in Claret or Vinegar.

In a difficult or tedious Labour.

There are many things occur either from the Weakness, Formation, or Situation of the Child, or from the indisposition of the Mother, or from both, which may require the assistance of Medicine as well as the Hand of the Operator: If the Mother or Child be Weak, the strength of both ought to be Corroborated, the Spirits Refreshed, and Nature stimulated to Expulsion: By comfortable Baths, Clysters, or Cordial Restorative Medicines. Take Mallows, Mugwort, *Brank Ursine*, Camomil Flowers, of each two Handfuls; white Lilly and *Althea* Roots, of each 2 Ounces; Balm and Pennyroyal, of each one Handful; make a Bath of them with New Milk and Water. Or, Take Mercury, Mugwort, of each a Handful; Camomil Flowers two Handfuls, Briony and Birthwort Roots, of each half an Ounce; Cummin Seed 1 Ounce, boil in Water, and to six Ounces of the strain'd Li-

quor add Lenitive Electuary 1 Ounce, Oil of Amber two Drams, the Yelk of an Egg; make a Clyster. Internally give Confect of *Alkermes* half a Dram, Saffron half a Scruple, Oil of Cinamon 2 Drops; make a Bolus, and give the following Draught. Take Balm Water 1 Ounce, Pennyroyal Water half an Ounce, Briony 6 Drams, Crab's Eyes, and Pearl, of each half a Scruple; Syrup of Mugwort half an Ounce, or drop Oil of Aniseed or Fennil 3 or 4 Drops upon Loaf-Sugar, and give the Patient in a Glass of Cinamon Water, or *Malmsey* Sack: Likewise 1 Scruple of the Testicles of a Horse, the Powder of the *Secundine* or Afterbirth, Castor or Troches, of Myrrh in a Glass of Generous Wine, or Cordial Water. Externally anoint the Navel and Belly with Oil of Amber, or Camphire, or an Ointment made from Vipers; and foment the Parts with a Decoction of Savine, Motherwort, Horehound, Balm, &c. If the Parts are not sufficiently Lubricated, they ought to be Relaxed with Oils, and emollient Decoctions, if the Passage be strait; in like manner with Emollients, Oils of Lilies, Sweet Almonds, the Nut Ben, the Fat of Hens, Geese, &c. or the Mucilage of Linseed, Quinces, Marsh-mallows, &c.

Of the Dead Child.

This ought to be expell'd or drawn out by the Hand as soon as possible: And first by Sternutatories or Emeticks, as an infusion of *Asarabacca* Root, or a Dram of the inward Bark of the Walnut Tree: Or let the Patient take of white Hellebore Root, in Powder 1 Scruple, *Euphorbium* 6 gr. Camphire to snuff up the Nose; or give Dictamny or Crete, Castor and Borax, of each half a Scruple, Saffron 5 gr. the Testicles of a Horse powder'd 6 gr. *Vervain* and Cinamon Water, of each half an Ounce; mix for a Dose. Take of Savine in Powder 2 Scruples, in a Glass of Wine or Cordial Water: To allay the Pain, and strengthen the Parts, after the Dead Child is delivered, use a Decoction of Rosemary, Wormwood, St. John's Wort, and Myrrh; then anoint with Oil of Myrtles, Sweet Almonds, St. John's Wort, of each half an Ounce, *Sperma Ceti* 2 Drams, Deer's Suet 1 Ounce, white

Bees-wax; enough to make it into an Ointment.

Of the Retention of the Afterbirth.

When the Midwife cannot extract the Afterbirth, but is forced to wait the effect of Medicine, let her be speedy in her Application, and first of all make a Womb Injection which administer presently. Take Pellitory of the Wall, Mugwort, and Pennyroyal, of each a Handful; Savine half a Handful; Sage, Camomil, and Melilot, of each one Pugil; Aniseed and Fennil, of each 1 Ounce; Bayberries 6 Drains, boil in Sheeps-head Broth 10 Ounces; in which put Syrup of Violets, and Tincture of Myrrh, of each 1 Ounce; then give the following in Internals to promote and further the Work. Take Marjoram, Pennyroyal, of each half a Handful; Camomil 1 Pugil, Parsley, and Lovage Roots, of each three Drains; boil in Wine and Water 8 Ounces, for 2 Draughts. Or, Take Castor and Saffron, of each half a Scruple; in a Glass of Wine: Or Roots of round Birthwort in Powder 2 Scruples, Myrrh half a Scruple, or snuff up the Powders of Nard, Savine, Mugwort, Pennyroyal, and Dictamny mix'd together.

Of the Suppression of the Lochia, or Women's Cleanings.

If Blood abound, and be driven to other Parts of the Body; we are to use Frictions in the Womb, Ligatures, Cupping, and Scarification upon the lower Parts, which if not sufficient we must open the Vein in the Feet; but if this Evacuation be too fully suppress'd, it is necessary that we institute Bleeding; not neglecting other Revulsions, and afterwards loosen the Bowels, and Aperitives are to be made use of, together with Externals: Let the Region of the Womb be anointed, and all the whole Belly, with Oil of Sweet Almonds, Ointment of Marsh-mallows, Hen's Greese, to which may be added Saffron, Oil of Angelica, Spike, and Cinamon; or Bath with a Decoction of Plants, prescribed before in the Suppression of the *Menfes*. The Water and Decoction of Stone Parsley Roots, and Radish are very Proficuous, or the Juices of these drink in Wine: The following Cly-

ster is excellent. Take white Lilly and Marsh-mallows Roots, of each half an Ounce; Pellitory and Mallow Leaves, of each one Handful; Camomil, Elder, Melilot Flowers, of each 2 Pugils; Fenugreek and Linseed, of each half an Ounce; boil in Water, and to 8 Ounces, thereof add Oil of Dill and white Lillies, of each 1 Ounce; Ointment of Sowbread 6 Drains. A few Days after Delivery purge with Rhubarb, *Sena* and *Agarick* prepared, with the opening Roots, and *Manna*: Give the following Apozem. Take of the 5 Aperitive Roots, of each 2 Drains; Leaves of Betony, Endive, Maiden-hair, of each 1 Handful; Fennil and Aniseed, of each half a Dram; Boil in Water to a Pint, and then add half Cinamon Water, and Tincture of Saffron, of each one Ounce and a half; of the Syrup of the 5 opening Roots 4 Ounces: Give 3 or 4 Ounces of this twice a Day. Before the Fever increase, exhibit 1 Dram, of Troches of Myrrh in White-wine, or use of the following Decoction. Take of Pearl Barley, 1 Handful; Liquorice half an Ounce, *Schœnanth* 1 Dram and a half, boil in a Pint of Water for 3 Doses, and use an Ounce of *Schœnanth* in Chicken Broth for weak Women: A too great Flux of Blood after Delivery is to be treated as the *Hæmorrhage* before spoken of, &c.

Of Afterpains.

These with Gripes and Tearings in the Belly are best cured by Anodynes, if the Cause be removed: For this purpose give the *Species Diagalangi*, *Diacymini*, with *Diamargarite*, in a draught of Broth, with Oil of Sweet Almonds 1 Ounce, Mace, and Carui by Distillation, of each 2 Drops. Likewise Camomil Water, or the Tincture thereof; so Cinamon, Ginger, Mace, Cloves, Saffron, and Orange Peels are useful. Take *Species Diacymini*, *Diamargarite*, frig. Orange Peels, *Zedoary*, of each half a Dram; mix for a Powder, or give the following: Comfrey Roots 1 Ounce, Peach Kernels, Nutmegs, of each 2 Scruples, Amber half a Dram, Ambergreese half a Scruple; Take a Dram of this in White-wine, or if the Fever prevail in Broth: But the best Method in these Pains is the Opiates joyn'd with the

Volatile and Lixivate Salts, as *Matthew's* Pill, that of *Hounds-tongue*, and *Storax*; twelve Grains whercof is a Dose which will promote the *Diaphoresis*, as well as ease Pain; but if these Gripes proceed from Bilious and Acrid Humours, they are to be cured after the same manner as Cholick Pains. External Medicines may be likewise administered: As Oil of Dill and Camomil, or the following *Sparadrap*. Take Turpentine 2 Ounces, the Anodyne Ointment 1 Ounce, common Oil of Rue 1 Ounce, Wax half an Ounce, chinnical Oil of Rue, Savine, and Mint, of each 6 Drops; *Sperma Ceti* 1 Ounce, apply over the whole Belly after Delivery, *Riverius* commends *Galbanum* and *Affasatida*, of each 1 Ounce; made into a Plaster, with 4 Grains of Musk laid in the middle.

Of the Tumour of the Womb, Belly and Feet.

If the Tumour proceed from the Womb, it must be cured by Fomentations made therein, but if from vicious Humours, a good Diet and gentle Evacuation relieves: As, Take *Sena* clean pick'd 2 Drams, Fennil Seed half a Dram, *Daucus* of Crete one Scruple, Salt of Tartar one Dram: Infuse in some Carminative Water all Night, and boil in the Morning. Or, Take some Pills of *Hiera* with *Agarick*, acuated with a few Grains of *Dingridium*, afterwards it will be proper to take 2 or 3 Lozenges of *Galangal* or *Diacymini*, or some other Drops of Oil of Mace or Carui in a small Glas of Wine; or take 1 Dram of the following in a Mels of Broth. Take *Galangal* and *Zedoary*, of each 1 Dram; Saffron half a Dram, Pennyroyal, *Origanum*, *Scordium*, of each half a Scruple; make a Powder. For Chaps and Wrinkles of the Breasts and Belly; *Sperma Ceti* Oil of Ben, and white Lillies form'd into Ointment or Liniment, with a little white Wax, is the most excellent; those who are more delicate may perfume it with Civet, Musk, Ambergreece, or the Oil of Jessamine, which is very fragrant and useful in it self: If the Breasts are apt to extend and grow large, some Astringents may be added to this Liniment, as *Balaustians*, Maltich, Dragon's Blood, and Oil of Myrtles.

Of Fevers incident to Child-bed Women.

Those which proceed from the Spring of Milk generally come about the fourth Day, when the Breasts begin to fill, and the Cleansings flow duly: But when they are natural and without Danger, they disperse of their own accord about the ninth Day, washing away by Sweat and a large or vigorous Perspiration, where a good Regimen and Diet is observed: But those Fevers which come from a Suppression; first must be cured by Blood-letting; secondly Purgings; thirdly a Provocation of the *Lochia*; and fourthly by Alteratives. We may therefore safely proceed to bleeding in such case by a Vein, but if weakness will not admit of that, Cupping and Scarification may be used upon the Legs and Thighs; and if the Course be over, if the Fever increase we may proceed to bleed in the Arm. As to Purgation, the most Lenitive are still the most assisting in all these Cases, as *Cassia*, *Manna*, *Syrup of Roses*, *Succory*, with *Rhubarb*, *Sena*, &c. Take Prunes, N^o. 10 *Pulp* of *Cassia* 1 Ounce, *Calabrian Manna* one Ounce and a half, or *Sena* one Dram and a half, *Rhubarb* 1 Scruple, Mace 6 Grains; infuse in a Decoction of Prunes stoned, in the Morning boil and strain, then drink it; but Alterative Medicines may be safely given, provided they be such as do hinder the Child-bed Flux; such as *Succory*, *Borage*, *Endive*, *Maiden-hair*, *Barley Water*, *Pomegranate Juice*, &c. Let the Diet be thin and sparing, especially for the first Week; as *Barley Water*, or *Chicken Broth* made with *Barley*, and though the Fever be on, Wine is not intirely to be forbid, but us'd with Discretion.

Besides these Child-bed Fevers there are such as are call'd *Concomitant*, as the *Pleurisie* and other Inflammatory ones, of which we shall briefly remark these following things; first in the *Pleurisie* the Vein is to be cut, not in the Arm, but in the Vein under the Knee, call'd the *Popliteus*, so that Nature may Evacuate the Blood and peccant Humours by the *Uierus*; which being done, if no further Symptoms continue, a Vein in the Arm may be open'd, and if there be any Apprehensions, that the course

of the Blood should be drawn upwards, the Parts must be rubbed well below, and Cupping Glasses applied to the Legs, to make a Revulsion, and this is likewise to be observed in the Sore Throat, and Inflammation of the *Liver*. In the second place, Clysters ought to be administered in a *Pleurisie*, that they may recal the Motion of the Humours from the upper Parts downwards, and likewise free the Passages of the Womb, that the Blood may more easily be evacuated or discharged from thence. Take the Herbs, Mercury, Pellitory, Mallows, red Cabbage Leaves, of each 1 Handful; Camomil Flowers half a Handful, Linseed and Fenugreek, of each half an Ounce; boil in common Water, in a Pint whereof dissolve Lenitive Electuary 1 Ounce, *Diacatholicon*, or *Cassia* half an Ounce, Oil of Violets two Ounces.

If the Fever remits not, and the time of the Cleansings be almost over, there may be a gentle Purge given: The other methods of cure we shall refer to those places where we have treated of the *Pleurisie Angina*, and Inflammation of the *Liver*. Besides those we have named, there are other accidents attending Child-bearing, as the breaking of the *Vulva* into the *Annus*; the Cure of which we have already taken notice of, as well as Ulcers of the Womb, Descent, Inflammation, Falling down of the *Annus*, Wakings, Delirium, Epilepsie, Vomiting, Diarrhæa, and incontinence of Urine.

Of the Diseases of the Breasts.

And first of the Tumours thereof, all things are proper which alter and cool as in the Inflammation; a Plaister of *Sperma Ceti*, Oil of Henbane, &c. are proper Remedies, so the Elixir of Vitriol. In the *Scurrhus* must be admittred such things as purifie the Blood, are Aperitive and Splenetick, and which are serviceable in Melancholy Indispositions. In a Flatulent Tumour Oil of Camomil is good. In Tumours which arise from a Retention of Milk in the Breasts, there is no present or immediate Remedy equal to the Plaister of Frog's Spawn. We have already treated of the *Cancer* of the Breast, under the Title of *Cancers* in General, in the second Volume. We shall there-

fore proceed to distinguish the Diseases which happen to the Breasts, and the Operations which they require into two Parts: Namely, those of the Nipples, and those of *Mamma* or *Breasts*.

The Nipple is that Eminence which jets out in the middle of the Breast, and in which terminate all the Lacteal Passages, which pour the Milk into the Child's Mouth. When the Nipple is too small, the Child can scarce take it, and only plays with it; and when too big, its Mouth being too full with it, it cannot Suck. But to chuse a middling and well proportion'd, it must be about the bigness of a Hazle Nut, and somewhat longer, to the end that the Infant holding it betwixt his Palate and Tongue may easily receive the Milk tho' it suffer never so little. The small Channels through which this Liquor runs out cannot be too open, without letting the Milk out before the Child has occasion to suck it; nor too close or too small, without fatiguing the Infant, by the efforts which 'tis forc'd to make to express the Milk: They must be moderately dilated, that upon withdrawing the Child as soon as it has drawn the Nipple we may see it stream out in several Spouts like a Garden Watering-pot; when the Milk comes forth in this manner the Child need only Swallow, without being put to the Pain of Sucking, and these qualities joyn'd to several others make a good Nurse.

In Women which have never given Suck, the Nipple is sometimes not form'd without great difficulty: The Child cannot take it, it immediately lets it go, because 'tis not yet sufficiently advanc'd outwards, and this is what Women call not having the String yet broken, because it seems to be retain'd as it were by a small String: The manner of forming it is to cause the Woman to be suck'd by a Child of 3 or 4 Months who being stronger than her own just Born, will better mouth the Nipple; or else to cause the Nurse to suck her, or one of those who are used to form Nipples for Women in the beginning of their lying In: That done we put on a small Cap made of Box, shap'd like a Thimble, which the Women put on their Fingers when they sew, hollow in the middle to receive the Nipple, and pierced at the

the End and Sides to let out the Milk which may escape. This Cap, which is taken off only when the Woman gives the Child suck, is proper to form the Nipple. There is another yet more commodious, that has a Brim like that of a Hat, which hinders it hurting the Breast.

Some Children not finding Milk enough, suck the Nipple so violently, that it becomes chafed and cleft at its Basis, so much that it seems ready to separate from the Breast. This happen'd to several of the King's Nurses: Those who had not Milk enough, he bit their Nipples even till the Blood came, and as they could not resist him, they were obliged to be frequently changed. Oftentimes, after lying in, the Milk running plentifully into the Breasts curdles and hardens, which may proceed from the Woman's catching cold, or her too soon uncovering her Breast, or from putting on some Dress which presses the Part too much; in which Cases Women cannot be too cautious to keep their Breasts well covered with quilted Linen Cloths, because the Heat prevents the Milk coagulating, and opens the Ways which it ought to take to come forth to those who will not give suck.

This Accident sometimes happens to Nurses, when there is some Obstruction in the Glands of the Breast, when they have continued too long without giving suck, or when the Cold has seized them: They then say that they have the Hair, and this Indisposition throws them into a Fever for 24 Hours and more. When the Disease proceeds from Obstruction, we must make a Liment of Oil of Sweet Almonds on the Breast, and make use of gentle anodyne and emollient Cataplasms; if from the excessive Quantity of Milk, it must be remedied by Bleeding and Diet; and if from Cold, Heat must repair the Disorder which its contrary has occasioned.

The Surgeon is obliged to endeavour to evacuate the curdled or clotted Milk which is in the Breast, without which its Continuance will not fail to cause an Abscess. There are two Ways of getting it out, insensibly or sensibly. Insensibly, that is, by Resolution, by the Use of gentle, cooling, emollient and resolute Cataplasms. If the first do not succeed, we make them

stronger with the four Sorts of Flour and *Limolian Earth* decocted in *Hydromel* or Mead, adding a little Oil of Roses. And sensibly, by forcing out the Milk through the Nipple; for the accomplishing of which three different Methods are proposed. One is the Application of a small Cupping-glass, whose Orifice is not to be larger than is necessary to admit the Nipple. The other Expedient is to cause the Woman to be suck'd by a healthful clean Woman, who having filled her Mouth with Milk, spurs it out, in order to return to her sucking; and thus continues till the Breast is drained. The third Way is for the Woman to suck her self by the Help of an Instrument called a Sucking-pipe, and by the *Italians Lattecole*. If a Woman finds the small Cupping glass inconvenient, or that the sucking Woman puts her to too much Pain, she may suck her self with this Glass Instrument, the large End of which is to be applied to and cover the Nipple, the Woman keeping in her Mouth the other End. By this Means she will be put to less Pain, but must continue till her Breast is wholly exhausted.

If notwithstanding all these Expedients, the Milk continues in the Breast, it will certainly grow to an Abscess, to the which 'tis the more apt, by reason that a very little Alteration is sufficient to turn it to Pus. In this Case, we are to open the Breast with a Lancet as soon as we perceive any Fluctuation, in order to prevent the Pus occasioning any Disorder in this very sensible and tender Part. 'Tis one of the old Wives Errors to believe that Steel Instruments are not to be used in Distempers in Women's Breasts, and we find Women obstinately persist in their Refusal to suffer them, when we are to leave them to be ruled by their own Caprice, for which they often pay very dear; for that they suffer a longer Time, in Expectation that the Pus should eat through the Skin to make its way out; and so instead of one Hole made with the Lancet, that sometimes breaks out into five or six, which miserably lacerate the Breasts, and then they repent of their Obstinacy.

But when a Woman submits her self to her Surgeon, he is to take a Lancet wrap'd in a narrow Bit of Linen, which leaves the Blade no further discover'd than is necessary

to make the Incision, which must be but twice as long as that in Bleeding, in order to evacuate the Matter only. We use no Tent in this Sort of Abscesses: No more is necessary than a Plaster cut in the Shape of a *Maltese Cross*, which is taken off as there is fresh Matter to come out. For my Part, after the Orifice is made, I always use such a Plaster, which I compose of the *Unguen-*

tum sacrum or divine Ointment, spread on a Piece of Leather, with which I cover the whole Breast, and have found it to succeed very well. The Patient dresses her self, taking off the Plaster three or four times a day to dry it, and warming it again when she puts it on. Three or four Plaisters renew'd from time to time mollify the Hardness, and proceed on to a perfect Cure.

Of the Diseases of Children, and their Cures. From Michaelis, Harris de Morbis Infantum, &c.

Of milky Scabs, and running sore Heads.

THESE must not be suddenly stop'd in Infants, because they preserve from the *Epilepsy*. If the Child suck, the Nurse or Mother must be purged with Pills of Fumitory and the Catholick Extract taken in Whey; then wash the Child's Head with a Decoction of Mallows, Borage and Barley. This being done, lay on warm Cabbage Leaves anointed with Butter, or else Ivy Leaves; also those of Orach or Marsh-mallow Roots boiled in Boy's Urine. Topicals are allowed, as the Juice of Fumitory, Scabious, Elecampane, Tobacco, Litharge, Oil of Nuts, Hogs Grease. *Forestus* hath an infallible Remedy for Boys, &c. Take, the Yolks of Eggs roasted hard, N^o 16. Myrrh, two Drams; Root of Cuckoo-pint, half a Dram; Black Hellebore, one Scruple; fry them in an Iron Frying-pan, without Flame, until they froth; then press out the Oil, and fry them so often till they will froth no more, cast away the Dregs, and keep the Oil for Use. In those that are older, it is cured by Digesters, and chiefly by Remedies that evacuate Flegm and Melancholy: Till these be often used, Topicals are not proper; for they are only to soften the Crusts, and then must be applied the Juice or Decoction of Fumitory, sharp Dock, Celandine, Ivy Leaves, Scabious, and Bean Flower. *Galen* only used burnt Paper soak'd in Vinegar, and anointed the Part affected, and so cured many. *Forestus* gives this following for a

Secret: Take, Salt Butter, Hog's Grease, of each one Ounce; Brimstone, half an Ounce; Quicksilver killed with Spittle, one Dram; and Vitriol, one Scruple: The Butter, Hog's Grease and Brimstone, must be melted apart; then add the rest. Lastly, it is cured as the *Small-Pox*: Balsam of *Peru* and Turpentine boiled in Juice or Water of Tobacco is good to foment with; but to perfect the Cure, nothing exceeds Antimony Diaphoretick mix'd with burnt Hartshorn, to which add Powder of humane Skulls and Crab's Eyes; give a little of this Powder twice or thrice a day in Syrup or Conserve of Elecampane. The *Syriasis*, or Inflammation of the Brain and Membranes thereof, is cured with Sugar of Lead in Lime Flower Water, those of Elder Flowers, or Nightshade.

Of the Epilepsy in Infants.

If this arise from the Consent of the Parts, then Specificks are always to be mix'd with the Epilepticks: If from Fear, the *Smaragdus* may be given, because it answers two Intentions: If this proceed from bad Milk, a gentle Vomit is best, such as may be procured by Oil of Sweet Almonds fresh drawn, or Oil of Ben: If from Worms, then such Medicines are to be administer'd as destroy Worms, as well as such as are specific for the *Epilepsy*: Amongst the Internals, Antimonial and Mercurial Medicines are the best. If from the *Small-Pox*, Epilepticks are to be made choice of, as the

Epi-

Epileptick Powder of *Langius*; Cephalicks and *Bezoardicks*: If this disorder come from the Brain, use the Magistery of Elks Claws, Tincture of the *Smaragdus*, Spirit of Urine, shaving of Human Skull, Pæony Flowers, Balsam of Amber, &c. Take of the Epileptick Magistery 1 Dram, *Bezoar Solis* half a Scruple; drink this in an Ounce of Pæony Water Compound, or 30 Drops of Tincture of Pæony, and the Epileptick Spirit of Vitriol mix'd together. Or, Take Lime Flower Water, Lilly of the Valley, and black Cherry Water, of each 1 Ounce. The Epileptick Water of *Langius* half an Ounce, Human Skull, *Smaragdus* prepared, of each one Scruple; sweeten with *Manus Christi* pearled *qs.* make a Potion.

Clysters may be given of Lime Flowers, Lillies of the Valley, of each 3 Pugils; Pæony Roots half an Ounce, *Sena* 2 Drams, boil in common Water, and in 3 or 4 Ounces of the strained Liquor, dissolve 2 or 3 Drams of *Hiera Picra*, Extract of Castor 4 or 5 gr. Or, Take Roots of Pæony, round Birthwort, of each half an Ounce; Rue a Handful, Agarick cut in Pieces 1 Dram, boil in Water as before, and add a Dram or Two of *Hiera Picra*, with Agarick; there may be added to these Clysters some Drops of Oil of Amber or Rue. Take Balsam of Amber, Oil of Rue, of each half a Dram; the Fat of the Castor or Beaver 2 Scruples, mix for a Balsam. Or, Take white Amber and Mastich, of each 1 Dram and a half; *Galbanum*, *Opoponax*, of each 1 Scruple; the Glew or Gum of the Oak 2 Drams, Pæony Seeds half a Dram, *Cadamum* two Drams, Ambergreece and Musk, of each 3 gr. Oil of Nuts, make a Plaister, which is to be spread upon Leather, in form of a half Moon, then strew upon it Powder of Cubebs, and apply to the Head, so that both Extremities of the Head may be covered.

Of Fearfulness and Starting in Children.

Where Infants are subject to start in their Sleep; give the Powder of Pæony, Elks Claws, &c. in Treacle, and externally apply *Crato's* Stomachick Oil; that of Nutmegs, and if this Disorder come from bad Milk or Worms, or the Epilepsie, lay upon

the Pulse *Mechoacaan* with the *Facula Pæonia* mix'd, or upon the Stomach lay the Plaister of Bread Crust and *Cardamum*, malaxed with Oil of Mastich, and Balsam of *Pernu*, or make a Balsam of exprefs'd Oil of Mace, and Nutmegs, of each 1 Dram, Oil of Aniseed half a Scruple, with this anoint the Stomach of the Infant; or administer a Clyster of Pæony Roots, Lime Flowers, and Aniseed boil'd in a little Water, and sweetened with Syrup of Pæony, and 6 Drops of Oil of Nutmegs by Distillation.

Of too much Waking, or want of Sleep.

Here the Physician ought to be Cautious least he injure the Infant with the too free use of Opiates, or Narcoticks: Externally use to rub the Temples with Mother's Milk and a little Saffron, Oil of Nutmegs by Expression, and Ointment of Populeon: Internally may be given the comforting *Anodyne* Powder, or white Poppy Heads boil'd in Breast Milk, and sweeten'd with Syrup of Corn Poppies, or the Head may be fomented with an Infusion of white Poppy Seeds in Spirit of Wine Camphorated, and Breast Milk, to which drop 6 Drops of Oil of Dill, and as much of Nutmegs: Or give the Child 2 Drams of Syrup of *Diacodium* in some *Hypnotick* Water.

Of the Running or Moisture of the Ears.

Externally may be apply'd the Chymical Oil of Wormwood, Spirit of Urine that is not too Acrid, by being often rectified, Oil of bitter Almonds, fresh Urine of a Child and such like, but above all the Spirit of Millepedes and those of Ants or Bees drop'd in Oil of Ben, and put into the Ear with Wool or Cotton.

Of the breeding of Teeth.

The White Scours incident to Children on this occasion are not to be presently stop'd, least the Epilepsie or Convulsions prevail. The Swell'd or Tumefied Gums must be anointed with the Blood of a Cock's Comb, the Fat of a Hen, Oil of Lillies, Camomil, Ointment of *Althea*, and the like.

like. Take Fleawort Seed, Linfeed, and Marsh-mallow Seed, with Rose Water, extract a Dram and Half, instead of Julep of Roses add Sugar Penids, and make it of the consistence of a Liniment; what is necessary on this subject hath been touch'd before in the First and Second Volumes.

Of the Cough.

If the Matter descend from the Head and form a *Catarrh*, the best Remedy is fresh *Sperma Ceti*, given by itself. Likewise Amber, the *Facula* of *Arum*, Orrice, Pæony and Human Scull prepared. Take Oil of Sweet Almonds half an Ounce, Sugar Penids *qs.* to make a Linctus or Pap of it, add the *Species Diarragacanth* frigid half a Dram, *Sperma Ceti* recent 1 Scruple, apply a Cerecloth to the Stomach made of *Tacamahaca* malax'd with Oil of Mastic, and Tincture of *Benjamin*. If the Cough proceed from a pituitous Matter the Powder of *Mechoacan*, with *Facula Aronis* may be given; in a dry Cough the *Species Diarragac.* and *Diapenid*: Externally anoint with the Pectoral Ointment; internally give Hyssop and Scabious Water, of each 1 Ounce, Syrup of Elecampane, and Oil of Sweet Almonds, of each half an Ounce; give a Spoonful now and then. Where the Matter is Viscid and Tough; Take white *Mechoacon* 1 Dram and a half, *Arum* in Powder 2 Scruples, Human Scull prepared half a Dram, *Species Diarreos* one Scruple; mix and give half a Dram of this once 3 Day in Breast Milk. Or, Take Oil of Sweet Almonds 1 Ounce, *Manna* 6 Drams, Extract of Liquorice two Scruples, *Lac sulphuris* 1 Scruple, with Scabious or Hyssop Water; make a Lambative to be given in a Tea-spoon: If occasion be add 3 or 4 Drops of Oil of Aniseed. Take Confection of *Alkermes*, or Juice thereof, 1 Scruple, Camphire 7 gr. Oil of Fennil or Aniseed 2 Drops, give in a Spoonful of Syrup of Violets. Take the tops of Dill, Camomil, and Elder Flowers, of each one Handful; Fennil Seed 2 Drams; boil them in Calves or Sheepspluck Broth; to six Ounces of which put Honey of Roses 2 Drams, and make a Clyster for a Child of 4 Months old to that of 12 or 18 Months.

Of Paking or Vomiting.

This is not to be suddenly check'd, but some times promoted, according to the Nature and Exigence of the Case which is done by giving Oil of Sweet Almonds in Plenty; or for Revulsion sake by administering of Clysters. Likewise it is serviceable to use the *Emplastrum de Crusta Panis*, with Oil of Mastic, and a Cataplasim or Pultise of the sharpest Leven of Mint, red Rose, Frankincense and Nutmegs in Powder prepared, with Vinegar of Roses, or other appropriated Herbs, with Oil of Mastic, Nutmegs, &c. Internally give Crab's Eyes, Crab's Claws, Pearl Coral, &c. prepared with Vinegar.

Of the Gripes.

In this Distemper all Specifick Clysters are proper from Carminatives, or the Flow-ers of Camomil, Bay-leaves, Mint, Southernwood, and Bay-berries. Take the Species for the Carminative Decoction half a Handful, Bay-berries 2 Scruples; boil in Water to two, 3, or 4 Ounces, of which add the Electuary of Bay-berries 3 Drams, Oil of Rue, and Cummin of each 4 Drops. If you are apprehensive of the *Epilepsie*, add Oil of Rue in all Clysters and Externals, Take of any Carminative Water 1 Ounce, Syrup of Orange Peels 6 Drams, Oil of Cinnamon 2 Drops; make a Plaister of Bay-berries, with Oil of Dill and Camomil, in all Gripes and Wringings of the Belly Aniseed grossly bruised and given, not only expels Wind, but loosens the Belly. If the Gripes are very obstinate make a Bath of Camomil Flowers, tops of Dill, Rue, and Bay-leaves, and at the same time give the Child about the size of a Pea of Venice-Treacle.

Of the Cardiack Passion, or Heart-burn.

In Inflations of the *Hypochondria* Aniseed is very prevalent, Roots of Angelica and *Species Diacymini*. Take powder of Orrice Root and Aniseed, of each 1 Scruple; *Facula Peonia* half a Scruple, Syrup of Orange

range Peels 6 Drams; mix for 2 Draughts to be taken upon the Paroxysm or Fit: So anoint the Breast and pit of the Stomach with the *Cardiack* Ointment 1 Ounce, distill'd Oil of Angelica, Dill and Camomil, of each half a Scruple.

Of Costiveness.

Give in this case, at first, *Cassia* fresh extracted, *Manna* Pulp'd, Raisins and Currans, Prunes, Pulp of Apples, but if these will none of them move, *Mechoacan* and *Agarick* may be admitted, or suppositories made thereof, and the Parts anointed with Oil of *Diacolocymbidos*, or rotten Apples made into suppositories with Goose Dung, &c. Goose and Hen's Greese put upon the Navel with a Walnut will loosen the Belly; so Ointment of Sow-bread and *Althea*, especially if mix'd with an Oxes Gall, for Clysters use the Emollient Decoction with Linseed or Rape Oil.

Of the White Scoure in Children.

Give absterging Clysters of *Scordium*, and Syrup of Roses Solutive: Amongst the Astringents to the most particular are Rhubarb roasted before the Fire, red Coral, Juice of Citrons, Ivory, Hartshorn, Nutmegs, Mastick, Cinamon Water, Syrup of Quinces, Coral, and Mastick; externally used are Oil of Quinces, Myrtles, the Countesses Ointment. Take Magistery of Coral, with Juice of Citron 1 Ounce, *Crollius Striptick* Powder divide into 3 Doses, and give in the white Hartshorn Drink, made with Syrup of Orange Peels. Take burnt Hartshorn, Magistery of Coral, or Coral prepared 1 Dram, Pomegranate Powder and Mastick, of each 1 Scruple; mix and take as before. Take Oil of Mastick and Myrtles, of each 1 Dram; Nutmegs by Expression 2 Drams, for a Liniment. Or, Take the Countesses Ointment 3 Drams, Oil of Mace by Expression 1 Dram, Oil of Myrtles *qs*. Or, Take the *Emplastrum Diaphanicum qs*. Malax with Oil of Mastick, apply this to the Belly.

Of Worms.

The Signs, The Mouth is full of Spittle, the Sleep is troublesome or disturbed, they scratch their Noses, chew often, and have a dry Cough: Infants cannot take very bitter Things: They are cured with the Coraline Powder, Wormseed, Roots of white Dittany, but above all with Calomel: As for Example, Take Calomel 10 or 12 gr. Jalap or white *Mechoacan* 6 gr. give in the Pap of an Apple, or a Fig, or a Raisin, for 8 or 10 Days together. Epileptick Medicines are often proper to be given along with such as kill Worms. If there be a Fever we must give cooling Things, as Juice of Lemons, Pomegranates, Oranges, Hartshorn, Bezoar, *Lapis Prunella*, and Clysters of *Sal Prunelle* boiled in Water, and a little Crystal Mineral with Syrup of Violets, apply bitter things outwardly to the Stomach and Navel, as Aloes, Myrrh, Oil of Wormwood; *Hearnius* commends Syrup of Succory, with Rhubarb half an Ounce, in the Hartshorn Drink, given for a Dose every other Day. Broad Worms require stronger Medicaments, as Walnuts, Fern Roots, which powder and give half a Dram to an Infant: Sweet things may be given in Clysters to allure the Worms downwards, as Syrup of Peach-flowers, Agarick, &c. The Bots are cured by Suppositories of Turpeth with Rhubarb, Aloes and the like, or according to *Aetius* a Suppository made of old Salt Beef, the Fat being taken off. For the *Hernia* or Rupture in Children, with the Prominence or Strutting of the Navel I refer you to what hath been already said on that Head, for the Inflammation of the Navel you may use Oil of Roses with Wax, the Plaister of Frog Spawn, or that of *Diapomphologos*.

Of the Stone in the Bladder.

Incontinence of Urine, of Galling or Chafing, and wasting in Children: Give the Nephritick Magistery half a Dram, in Milk or Water Pap: Or, Take Crab's Eyes and Amber prepared, the Nephritick Stone, of

of each half a Dram, give a Scruple at a time, drinking after a Spoonful of the following. Take Restharrow, Alum Water, and that of Saxifrage, of each 1 Ounce; Syrup of Marshmallows, and the Juice of Strawberries, of each 5 Drams. For a Specifick Clyster; Take Mallows, Pellitory, Saxifrage, Golden Rod, of each 1 Handful; Roots of *Althea* and Parsley, of each 2 Ounces; boil 'em in Water of Rhadish a Pint, Take six Ounces hereof and add thereto, of the Juice of Onions, and Oil of Scorpions, of each 1 Ounce; at the same time anoint the *Perineum* with a Liniment made of Fox or Human Greese 3 Drams, Oil of Scorpions 10 Drops, a little Bee's Wax. For *Incontinence of Urine*; Take Mastich, the Calcined Powder of a Hedge-hog, or Urchin, of each 1 Scruple; Take at Bed-time in Syrup of Cinamon 2 Drams, or a Spoonful. Or, Take of the Species of Plantane, *Martis Mynsicht*, of the burnt Urchin, of each a Dram. Or, Take the inner Coats of the Hens Craw calcined to powder 1 Dram, *Crocus Martis Astringens* 1 Scruple, mix as before: Anoint the Parts with *Ung.-Comitissa* 2 Drams, Oil of Mastich 1 Dram. For Chafing betwixt the Legs, or in the Groin, use *Lapis Calaminaris* in Powder finely grown with white Lead, and Plantane Water: Or the Ointment *Diapomphologos*, with Cerusse. If the wasting

or falling away of Infants proceed from Worms the Spine of the Back must be anointed with Honey, and the Child put into a warm Bath of Southernwood, Balm, Hyssop, &c. so the Worms will come forth of the Body, but if it arise from bad Milk, the Nurse must be changed, or the Blood purified in order to correct and alter the Milk for the better Restoration of the Health of the Infant.

Of the Fevers in Children.

They proceed either from bad Milk, Worms, or breeding of Teeth. The Nurse or Mother must be purged with *Diacatholicon*, Lenitive Electuary, Syrup of Roses, &c. give the Infants Alteratives, as the Juice and Syrup of Violets, Lemons, Endive, Succory: Anoint the Spine or Backbone with the Mucilage of Fleawort Seed, Oil of Violets, and Bee's Wax: Lay an Astringent of *Landanum*, *Tacamahaca*, of each 1 Dram and a half; Oil of Quinces, and Balsam of *Peru*, of each half a Scruple; to the Stomach. Take Conserve of Borage Flowers 1 Ounce, *Pulp of Cassia* 6 Drams, Mucilage of Fleawort Seed half an Ounce, the Dose is a Dram or two, Syrup of Succory with Rhubarb, and *Cassia* may be given.

Of the Medico-Chirurgical Observations about the Infirmities of Women.

Observation I. Of a strange Rupture of the Uterus.

Written to the Famous and Experienced Job van Meeckren, Chirurgeon in Ordinary to the City of Amsterdam, the Hospital, and the Noble College of the Admiralty.

Wherein several such-like remarkable Accidents about the Uterus, and other odd Cases of happy Cures are Related.

SIR,

WHAT Hippocrates saith of the most Dangerous Diseases, that they require the most difficult Remedies, may be justly applied to that dangerous Birth call'd *Cesarean*; though, if good Authors may be Credited, many have had good Success therein: Of which not a few differing Examples are Recorded by the learned *Franciscus Roussetus*, in his Book de *Uterotomothia*, and by some others. But in these our times very little is spoken of this Operation, for several Reasons.

1. Because of the slender Knowledge that most Midwives have, not only of this Operation, but also of others. For if they knew or considered, how necessary, in a well-constituted State, this Operation and Extraction of the *Fœtus* (the Mother being Dead before) is, and that *Civilians* account it Homicide, to bury the dead Woman big with Child, before the Child be cut out of her Belly; they would be more concerned for it. *Juriconsulti cum necis dan.nant, qui gravidam sepeliverit, non prius extracto fœtu, quod spes animantis cum gravida periisse videatur; lib. 2. De morino inferendo, & sepulchro edificando.* So that, when it happens that a Woman great with Child cannot be Delivered, there should always a Man-mid-

wife be at Hand, to save the Fruit and to perform this noble Operation, in case the Mother died before she be delivered. *Valerius Maximus, l. 1. sap. ult.* Relates, that *Gorgias* coming into the World after his Mother's Decease, did by his unexpected Cry stop those that carried the Corps, and so was carried out before he was Born. See hereof *Fabritius Hildanus* in his Answer to *Michael Dorengius*, Chirurgeon of *Breslaw*.

2. Because it is a difficult and troublesome Operation, especially for such as are not experienced in Anatomy, and consequently know not what the *Cesarean Section* means. Which is nothing but an Extraction of the *Fœtus* out of the Womb of a Woman, that cannot be delivered but by the Incision of her Belly and Womb, so to be made as to save, if possible, both Mother and Child, and that without impairing Fruitfulness; of which last see, among others, *Paulus Dirlewang*: who perform'd this *Cesarean Section* upon a Woman of *Vienna*, called *Margareta*, so that a Year after her Cure she was with Child again: Whose time of Travel approaching, and she finding her self unable again to be Delivered, sent also the second time for the said Master, who though he found the Woman ve-

ry Weak, yet perceiving the Child Strong and Vigorous, advisd again to use the Knife as formerly, which the Woman, who could not be saved without it, contented unto. But her Mother and others dissuading her from it, and exhorting her to trust rather to Almighty God for her Delivery than to undergo again so hazardous an Operation, she complied with them. But seeing that this Woman had carried her former Fruit Four Years in her Belly, whence it was at last cut out by Piece-meal, whereupon she was happily cured; why might not she have been saved this second Time, if the Child, which was strong and lusty had been cut out betimes.

3. Some are of Opinion, that enough hath been written of this Operation, and that nothing can be said but what hath been already said by others. But I am of a contrary Opinion, that whatsoever hath been written of *Physick* and *Chirurgery*, is not to be compared to what yet may be written thereof.

As for Example, *First*, concerning the cutting such an *Haremouth*, in which the upper Jaw-bone together with the Palat of the Mouth is Cloven, and the Lips are a full Inch gaping asunder: How much doth such an Operation differ from the Instructions left us by famous Writers?

Secondly, As to Women in Travel, whose dead Fruit is to be taken from them, I observe, that the chief Authors that have written of it, have been very little versed in that Operation; nor that the Instrument, called the *Hook*, is very convenient to pull out a Child's Head left sticking in the Mother's Belly: And what small use, if any at all, there is of the *Speculum Mairicis*, in this case, I leave to you to judge.

Thirdly, As to the taking out of the *Uterus* it self, of which many Famous Authors have written so much, I have largely treated thereof in a particular Observation, whence you will easily understand my meaning in this Point.

Fourthly, At this very time we understand both by Letters, and from Patients, something very considerable touching a new contrivance of cutting the Stone, practised in France at *Bordeaux* by a Lithotomist called

Raous de Chaistres, now dwelling at *Nismes*, used both upon Old and Young, and that after a quite other manner than hath been practised hitherto. For, after that the Patient hath been founded and felt by the Artist after his own Way, without any bodies being present, he then together with the Patient walks for half an Hour in his Chamber, and then puts him in his Servant's Lap, who holds the Patients Leg without tying him, and the Master useth no other Instrument but a little crooked Knife, and no Bands; nor doth he use any force in pressing the Belly, in lifting it up, or the like, thereby to get the Stone between his Fingers. 'Tis also done with less trouble and danger, without as much as observing the season of the Year, the Temperament of the Patient or his Age. He only thrusts two Fingers into his Fundament, so to get the Stone; which having compassed with little Pain, he conveys it with his Fingers to the *Os ischium* as far as he can: And then a little higher making an Incision with his little crooked Knife, of the usual bigness, but somewhat higher, and obliquely, beginning from the side of the said *Os ischium*, and so continuing to the *Perineum*; which Incision or Opening is more (in that Place) according to the Grain of the Fibres; as will be found, if viewed Attentively. Now, a small Opening made according to the Grain of the Fibres, will yield much more, and can by Laceration be somewhat widened, if it hath been made too little; (for the Wound, that is to be made in cutting the Stone, is better a little too small than too great;) and by this means with his Fingers he easily draws out the Stone, without the use of any other Instrument; and after having cleansed the Wound, he conveys and thrusts back the Bladder to its Place, whence it had been removed; preventing also the droppings of Urine, by dressing the Patient with an ordinary Band, who in seven or eight Days is perfectly Cured. I have also read a printed Letter, Entituled, *La nouvelle maniere de tailler la Pierre*, i. e. *The new manner of cutting the Stone*, wherein 'tis affirm'd, that then this Master had already cut, after this Way, above 50 Persons, of 20, 30, 40, 50 and 60 years of Age, with so

good

good Success, that not one of them all had died, yea that very few or none of them had had so much as a Fever. Thus you see, that Art is more and more improv'd by continual Discoveries, for which we ought to praise Almighty God, vouchsafing such and the like new Remedies to the benefit of Mankind.

The Historical Observation, Sir, which I have chosen to dedicate unto you, is of the *Rupture of the Womb*, in such a Person, out of whose Belly the *Fœtus* was cut, after she was Dead. The History whereof is this : In the Year 1658, the 24th of December, I was sent for in the Morning about Eight of the Clock, to come into the *Laurel-street*, to give my Advice and Assistance to Four of the Town-Midwives. These were disputing amongst themselves, whether the Fruit of this Woman in Travel lay right or not ; which dispute was the more Eager, because the poor Patient had then been already *Four Days* in Labour, with great Throws and Pangs, highly complaining of grievous Pains in her left Side, about and above the Navel. The Midwives differ'd very much amongst themselves, touching the Condition and Posture of the Child. One of them was of Opinion, that it was turn'd Right ; another of them, that it was turn'd the wrong Way, and was come with its Feet Foremost ; a third would have it, that it lay with its Fundament before the Passage, and that she had had her Finger in the Fundament ; and the fourth said, she had left the Child's Hands. So that, after long inquiry, I did not think it strange that they were thus Quarrelling, and so wide from one another in their Sentiments ; whence I collected, that it must needs be a difficult and dangerous Case ; finding, they could not give me any good Information concerning the Fruit, but inveighed one against another with keen Reproaches of Ignorance and Mistake : Which I interrupted by telling them, that these Contentions and Invectives were not the means of helping this poor Woman, much less the hatred which they seem'd to bear one another. Mean time I thought it most Advisable, to search into the matter my self, thereby to be enabled to prove by Reasons (of which they alledged none)

which of all the four was in the Right, and which not. And this being a dangerous Work, I began with making search of the State of the Child, by laying my Hand upon the Navel of the Belly, and desired the Woman to hold in her Breath, thereby to straighten the Fruit, and consequently to put it into a stronger Motion. At which time the poor Woman cried and wept bitterly, and complain'd exceedingly of intolerable Pains in her Belly and Loins, yet most of all above her Navel, about the lower part of her Stomach : The other parts of her Body I found to be very Well, but not as in a Woman in Travel ; for the *Internum Uteri Osculum* was yet very close, nothing but a little Moisture ouzing out ; but as for a Child there was no appearance of any such thing to be perceived. And this poor Woman having had more Children, she strove to bring forth this Child with all her Might ; to which she was encouraged by the Midwives aforesaid. But I, having made careful search, and weighed all things, forbid the Patient to strive so Hard, for as much as the Child, in my Opinion, was yet in the Membrane call'd *Chorion*, which is the most outward Coat wrapped about the Fruit ; and that those Midwives did all mistake the State and Condition of the Child, especially she that affirm'd, she had had her Finger in the Child's Fundament ; and I added, that, whereas they all judg'd those Pains to be throws for bringing forth, I was of a contrary Judgment, viz. that by those Pains no Child would be brought into the World ; but that, if this Woman should be delivered of a Child, there must be made an Opening in her Belly, shewing them the Place where ; which Operation, I said, had been often performed, witness several excellent Writers, who call it the *Cæsarean Incision*. To which the Midwives answered, that they had never heard of such a dreadful Operation. However, the poor Woman, who was *French* by Nation, look'd upon me with some Chearfulness, and intreated me, that I would use this Operation upon her, throwing off at the same time her Covering, and presenting her Belly to the Knife. Which, when I saw, I said to her in a kind Tone ; Dear Friend, you hear,

that

that these Women have never heard of this Operation; besides, 'tis not the Custom in this Country, to practise so extraordinary an Operation without the Consent of the Lords the Burgomasters; after the same manner, that the Operations in cutting the Stone are wont to do: And I should very much be blam'd and reproached, if this unusual and difficult Operation should fail of good Success; which God forbid.

Notwithstanding which, this poor Woman made instance, that I would put my advice in Execution; for, without it, she said, both she and her Child would be lost: Assuring me at the same time, that she had formerly been present at such an Operation in *Paris*, and therefore intreated me to make use of the same upon her. Whereupon I encouraged her, and said, I would consult with some of the best Physicians in Town, and desire their Assistance and Direction in this Case. Which having been done by me, they dissuaded me from it, because of the great Consequence, especially the Woman being very Weak. Returning therefore to her, I only prescribed her an Emollient Clyster, and exhorted her to some Patience. The Clyster was this.

R. Fol. *Bismalvæ*, m. i §8.

Artemisæ,

Matricariæ.

Pulegii, aa m §8.

Flor. *Camomill*.

Melilot, aa pugil. iij.

Sem. anisi, fenic. aa ʒij. Fiat s. a. decoctio; colaturæ sumatur ʒviij. in quibus dissolve Ele&tuar. sequens.

Diacath. Lenitiv. ana ʒj.

Ol. mucaginum ʒij §8.

Misce, fiat clyster.

And to renew her strength, as also to ease her Pains, I prescribed this Potion following, to take now and then a Spoonful of it.

R. *Aq. feniculi* ʒiiij.

Artemisia ʒij.

Cinnamomi ʒj.

Conf. *Hyacinthorum*. ʒij.

Laud. *piat. gr. j.*

Croci. §8. Misce, fiat potio.

Coming to her again about two a Clock in the Afternoon, I found the Patient yet Weaker, and in appearance near Death. Which made me give order to the Midwives, that as soon as they perceived her senses fail her, and that she was agonising, they should forthwith give me notice thereof, seeing that the Child did yet strongly stir in the Mother's Belly; and, if they spoke in good Time, there was Hope to save the Child, and so to acquit our selves of our Duty. There passed not full four Hours after this, but I received News that the Woman was Dying; which made me call, in my Way, upon some Physicians I knew, viz. the learned *de Vick, Piso, Sylvius*, and *Walterus*; of whom *Francis de Vick* and *Piso* promised to follow us.

Being come there, we found the poor Woman Dead, having a Key betwixt her Teeth to keep her Mouth open; which is practised amongst the Vulgar, who thereby think for a while to keep the Child a Live, as they also thrust their Fingers into the *internum uteri osculum*, to keep that likewise open, for the Child's Respiration. Now, when I laid my Hand upon this Woman's Belly, and perceived no Motion, I leap'd upon the Bed, and gave Dr. *Sylvius* my Anatomical Knife to open the Belly with all speed at the place where I formerly had found the greatest Motion, to wit, on the left Side, where the *Fœtus* lay, hoping to find it yet alive: But we failed of our Hope, for it was Dead, though in all appearance it had been so but a very little while, seeing the poor thing had its Lips yet cover'd with Fome, and very Fresh, so that 'twas evident, it was but very lately Expired.

Examining the Posture of the Child, we found, that it lay in the midst of the Belly, between the Guts, together with its Afterbirth in part so firmly fastned to the *Colon*, that we could not separate it from thence without Laceration. By the other Parts it was yet fast to the *Uterus*, an Inch Broad; which, in my judgment, was the only thing that enabled the Child to live two or three Days in the Mother's Belly, without the Womb; and I looked upon it as a wonderful Providence of Nature, that the Afterbirth, although it was by the shooting out

of the Fruit removed in Part, had forthwith so cloely fasten'd and united it self to the said Gut, that it could perform its Function, it being yet in part fast to the Uterus.

First, We found the Child lying between the Guts.

Secondly, The After-birth was in part fast to the Guts.

Thirdly, The same as to its other Part was yet fast to the Womb.

Fourthly, We found a great Opening or Laceration in the Womb.

Fifthly, We met with some black coagulated Blood in the Belly.

And here we much wonder, not only how this poor Woman came by this Mischiefe, but also how she could endure so great Pain, as must needs accompany it.

As to the Cause of this Evil, I judge not that to be Internal but External; viz. some Fall, or Blow, or Knock, or some outward Accident wounding that Part, whence store of extravasated Blood was diffused between the Membranes thereof, whereby the Womb was then disenabled to endure any throws in the Labour, and the strong and striving Motion of the Child, whose Hand or Hands broke through, and then the Water breaking also, the Child shot whole into the Cavity of the Belly, and so caused its own and the Mother's Death.

Besides, there is this reason which made me believe the Cause to have been External; for we found nothing in the Cavity of the Belly but black extravasated Blood, and Water, not at all mingled with any purulent Matter, which shew'd, that it was not come to pass by any Ulceration; so that I must conclude, this Woman had either received a forcible Blow, or had a violent fall upon her Belly. Where it is to be consider'd, that in a Child-bearing Woman by such a Force and Violence the inward Parts are more wounded than the Outward. For when the Skin and other Teguments are struck and contused, the extravasated Blood can be better Consumed, and by the Pores of the Skin discharged, than such Blood can be by the carneous Membranes of the Womb, inclosed between two Membranes. Besides, the Teguments of the Belly may be by a

knock pressed inwards, whereby in some measure they evade the Force; but the Womb is a Thick, Soft, Spongy, and in Child-bearing Women very much expanded Part, close woven through with Veins and Arteries; which, by reason of the consent of all its Parts with one another, cannot endure any Violence, but receiving the least Contusion, upon Bleeding, presently Relaxes, and tends to Putrefaction, which is promoted by the Heat of the Part. So that in our case the Womb was not able, as I said above, to resist the force and violent Motion of the Child in the Labour; which, with its Hands piercing through the weakest Part of it, made way for the whole to pass through, and to fall into the Belly. Whence it appears, that there was no other means but the *Cesarean Section*, to save the Fruit and Mother. For that the Womb, being assisted, can resist Mortification and Putrefaction, I have found in divers Cases, of which I shall here alledge one of the most considerable, which hapned when I served the eminently Experienced Chirurgion *Rogertsen Berenaert*, who was sent for, together with Dr. *Francis de Vick*, to come to *Uylenburgh*, to see a Ship-carpenter's Wife, that complained very much of great Pain about her Fundament, and intreated my Master to view and search the Part; who by his Stilet found in the *intestinum rectum* somewhat of a bony Substance, which being further searched, and drawn nearer, was found to be the two Feet of the Child, each Foot of half a Finger's Length. This giving my Master ground to ask the Woman, whether she had ever been with Child, he was answered by her, she knew no better but that she was with Child now; and, to her best Conjecture, four Months gone. Whereupon my Master immediately went to work according to Art, by extracting the Fruit by the Feet through this unnatural Passage; which was also follow'd by something that came away from before. Behind, there were yet fast some of the *vertebrae* of the Backbone; and the other parts of the Body, I mean of the Breast and Head, came not away but by Parcels, and by the natural Passage nothing came away but a small Rib. These Parts I washed with Brandy to free them

them from Stench: And it being Winter I expos'd them to Freeze; and then brought all to the learned Dr. *Nicolas Tulpus*, Consul of the City of *Amsterdam*, to whom my Master shew'd it, relating to him the Circumstances of this Case. The Woman herself was afterwards perfectly cured, by fit Remedies resisting Corruption, strengthening the Womb, and removing the Fever.

I could alledge more Examples of Ulcerated Wombs; but what I have said may at present Suffice. I shall now come nearer to my main Design, *viz.* the *Cæsarean Delivery of a Child*, for the further improvement of Physick and Chirurgery.

And to this purpose, Sir, I intend to treat at large of this *Cæsarean Section*, which, though it be a difficult and dangerous, yet is a necessary Operation: Which, according to the respective Circumstances of Cases is performable two manner of Ways.

First, To deliver a Child-bearing Woman of a *live* Child, so as to preserve both Mother and Child, when there is an impediment in Nature to do it otherwise: Which is performed by opening the Mother's Belly and Womb with a fit Knife, thence to extract the Fruit alive, together with the Coats and After-birth; and then by cleansing the *Uterus*, and healing up the Wound, after the manner as the Wounds of the lowermost *venter* are wont to be Healed.

But this is not to be attempted, until the Delivery by Midwives is desperate, and till all other means prove ineffectual, and the Mother is reduced to Extremity, and cannot be delivered any other Way; this being the only means left to preserve both Mother and Child, which may prove Successful, if their Forces be not too far Spent, but are in some measure yet Available; though it be not to be used, unless the Mother and Fruit be so Weak, that neither of them can be otherwise preserv'd. Examples whereof we have in *Scipio Africanus*, (who is the first Recorded in History, that was thus brought into the World, his Mother not yet being quite Dead;) in *Manlius* and others. And the said *Scipio* was the first of all, that was call'd *Cæsar* by the Romans. For they were not call'd *Cæsars* from *Julius Cæsar*, Emperour of *Rome*; but, as *Casper*

Bauhinus observes, *sortiti sunt nomen Cæsaris, quod è matris cæsi fuerint utero.*

This kind of *Section* was made by a very strange and sad Accident at *Sardam* in the Year 1647. the 29th of *August*. For the Child was not cut out of its Mother's Belly, but the Mother coming to succour her Husband, who was by an enraged Ox push'd to the Ground, and mortally Wounded, had her Belly torn up from the right Side to the Left by the Horns of the same Ox, and was herself tost up into the Air; the Fruit of her Belly with all its appurtenances falling to the Ground, and the Mother and Child being afterwards found alive, lying four Fathoms distant from one another. The Man, call'd *Jacob Egh*, lived, after he had received his deadly Wounds, 36 Hours, and his Wife 41 Hours. The Child was found safe, only its upper Lip, one Hand, one Foot, and the Genitals were swell'd and mark'd with black and blew Specks; and it was by good care preserved alive: For he was baptized the first of *September* by Dr. *Bergius* in the *New Church*, and call'd *Jacob*; his God-father being *Peter van Bekestein*, Magistrate of *Wessagon*, and he lived to the 23d of *May* 1648, at which time he died, and was buried in the same Sepulchre with his Father and Mother.

But to return to our *Cæsarean Section*, there is an Author, call'd *Roussertus*, that hath recorded many and different Examples of it, both of such as he had received from credible Witnesses, and of such as himself had performed. He is of this Opinion, that a Woman having yet any Strength, no time at all ought to be lost of delivering her of the Child, which otherwise must die it self, and in all appearance kill the Mother. For, the being open'd when her Forces are not quite spent, there is Hope of escaping Death, it so be that the Operation be perform'd by an experienced and careful Artist.

As to the *Second* Case of the *Cæsarean Section*, it is that which is done when the Mother is Deceased, and the Child yet alive. In which case the Chirurgion is to be at Hand, even whilst the Mother is yet alive, though ready to die, that so he may immediately perform that Operation, and open the Mother, to preserve the Child; for,

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when

when the Mother is Dead, the Child cannot live long, as receiving Spirits and Breath from the Mother; though, for as much as it lives by its own Soul and Life, it may live some little while after the Mother is Dead.

Yet *Rodericus a Castro* in his 4th Book de *Morbis Mulierum* judgeth, that this Operation is to be performed, not only when the Mother is in danger of Death, but even when she is dying, her Spirits being not yet quite extinguisht; because that the Life and Motion of the Child-bearing Woman ceasing, the Life of the Child, and the Motion of its Heart also ceaseth, which it had received from the Mother through the umbilical Vessels; the Child not taking in its Breath at the Mouth before the Navel-string is broke off. Now it's evident, that the Mother being extinct, the Child cannot fetch any Breath in its Mother's Belly, whilst 'tis inclosed in its Coats, and in the Womb: Whence appears the necessity of this Operation, if you mean to get the Child alive out of the Mother's Belly; whereas otherwise it must be suffocated in the Womb as in a Dungeon, to the great Grief of some Fathers, who may thereby lose either their illustrious Name, or Heirs to a considerable Estate, or both. Of which not long since there hapned a sad case at the *Hague*, when I was called to an *English* Countess, to deliver her of her Child; but coming too late, she was open'd, and the Child also, to my great Trouble, found Dead: Which case prompted me the more to discourse with you of this Argument.

The necessity of this Operation appears also from the *Spanish* History speaking of *Sanzius*, King of *Navar*, whose Mother being a Hunting, was barbarously kill'd by the *Saracens*, giving her a Wound in her Belly, whereby the Hand of her Child came to shoot out, which being perceived by a Noble Man that was present, call'd *Gueverra*, he brought the Child to the World thorow the Wound, and bred it up secretly. And when afterwards there arose a great Dissension among the Princes about the Election of a King, he acquainted them with the wonderful preservation and secret Education of this Child; whereby all disputes were composed.

But to proceed; I intend not to detain you, Sir, with the Recitation of all the Causes, that may produce hard Labour, and a troublesome Delivery; but shall only represent to you the Cause that necessarily requires the *Cæsarean Section*, not to be avoided but by the loss of Mother and Child. These are, in regard of the *Fruit*.

1. When that is too fat and too big in respect of the Mother, and therefore cannot possibly be brought into the World the ordinary Way.

2. When more than one Child strive to come forth together, and one of them being Dead, lies in the Way of the other.

3. When the Fruit is a Monster; for Example, a Child with two Heads, three Arms, four Hands, three Legs, four Feet, &c. which case hath come before the experienced Chirurgeon *Steven Vennekool*, the 16th of June 1636. in one *Femmetie Fans*, Wife of *Barent Fans*, Taylor, dwelling at *Amsterdam* in the *Wyde-steegh*, in the presence of *Dr. Nicolaus Tulpus*.

4. When the Fruit is Dead, and petrified; of which an Example is recorded by *Johannes Albofius*, *Medicus apud Senonas*, which was of a Child, that had lain inclosed in the Womb of one *Colomba Chatry*, for the space of eight and twenty Years, and was there Petrified.

5. When the Fruit is all consumed but the Bones, and by an Ulceration about the Navel shews the Way of Delivery; of which there are divers Examples to be found in *Roussetus* and others.

As to the Causes in respect of the *Mother*, not being able to bring forth, they are these;

1. When she is too streight to be deliver'd the ordinary Way; and that in regard of her Years, having been Married too Young, or impregnated too Old.

2. When by some scar the parts are hardened, or made narrower, or even grown together; of which hereafter I may alledge some Examples in my own Practice, when I shall come to speak de *clausura Uteri*.

3. When hard Tumours arise in *collo Uteri*, which do so streighten it, that the Woman cannot be deliver'd the usual Way, and the time of Delivery being come, it

cannot be delay'd, untill those Swellings are Ripen'd.

4. When there is any carneous Excreſcence in *Vagina uteri*; of which I had this very Year an Example, where both you, Sir, and Mr. *Rogert Berenart*, were called to aſſiſt.

5. When the *Os pubis* is grown unnaturally big, or ſtands out.

6. When the Neck of the Womb is grown Callous, Uneven, and Hard, either by ſome impacted Humor, cauſing a *Schirrus*, or *Lupia*, or by any other hardned Swelling, Though 'tis certain, that when they are accompanied with any cancerous Ulceration, from a thin, ſharp, blackiſh and fetid Matter, ſuch Women, thus condition'd, are never found with Child.

6. When there is a carneous Swelling within the Womb, which vulgarly is called *Mola carnea*, faſtned to the ſide of the Womb, and hindering the paſſing of the Child.

But it happens alſo, that ſuch a ſwelling comes to grow to the Fruit it ſelf; of which caſe Authors do ſay, that when it falls out, ſuch Children ſeldom come to Maturity, becauſe ſuch Swellings withdraw from them their due Nouriſhment, and take away that competent room they require.

Now theſe Cauſes, which require this difficult Operation do ſufficiently indicate its Neceſſity. But yet it muſt be well conſidered, whether it is to be executed in a deſperate natural Birth or not. Wherefore it will not be amiſs to weigh this matter ſomewhat more narrowly, and upon what Occaſions this Section is moſt required, viz. Either when the Mother is Living, and the Fruit Dead; or, when the Fruit is Alive, and the Mother Dead; or, when both of them are yet Living.

Varandæus ch. 6. lib. 2. de *Morbis Mulierum*, ſaith, that he cannot believe, the Child can be alive after the Mother is Dead; affirming poſitively, that 'tis impoſſible, for aſmuch, as long as the Child is in its Mother's Belly, it is maintained by no other Life but that of the Mother: From which Opinion I muſt diſſent. For the Child lives by its own Life, and Motion, and Soul, though it be fed by the maternal Blood; ſo that it may, notwithstanding, live a little while after the Mother's Death. And this

ſentiment I maintain with *Franciſcus Ranchinus*; and that both by the Authority of the Learn'd in the Law, and Experience. Only care is to be had, that as ſoon as the Mother is Dead, the Operation be with all poſſible ſpeed performed; and 'twere to be wiſh'd that this Matter in our Country were not ſo negligently ſkip'd over.

If the *Fruit* be dead, and the Mother yet alive, then the above-recited Reaſons touching a dead Child or a dead Mother ought to prevail.

But the Learned *Varandæus* is of Opinion, that the *Cæſarean Section* is not to be uſed when the *Fruit* is Dead, and the Mother yet Living, that the Chirurgeon may not appear to have been the Cauſe of her Death; but he would have this Operation to be performed, when both Mother and Child are yet Alive, and when 'tis impoſſible to bring the Child into the World but by this means; and then he thinks it better, to ſave one of the two, than to let them both Perish. Thus he;

Now what concerns the Delivery of the Child, therein is no Difficulty, nor Danger. But, as for the Mother, though the Wound, given her, be Great and Dangerous, yet 'tis not neceſſarily Mortal, as we ſhall hereafter ſhew by many Examples. I conclude therefore with the Famous *Corn. Celfus*, lib. 2. cap. 10.

Satius eſt, anceps auxilium experiri.

To this I ſhall add another Example, recited by Mr. *John Girault*, ſworn and very Famous Chirurgeon at *Paris*, in the 74 ch. of his *Annotatiions* upon the *French Chirurgery* of *Jaques Dalechamp*, Doctör of Phyſick, and Profeſſor at *Lyons*, concerning an happy Cure, by which both Mother and Child were preſerved by the *Cæſarean-Cut*; viz:

The 12th of May 1628. *Madam Mary des Auxnaix*, Wife of the *Sieur Jacques Jouan*, Sadler in the Town of *Loudun* in *Poitou*, was happily brought to Bed of a Son; the third time, by the *Cæſarean Section*, and that by the Industry and Dexterity of that very Expert Maſter *Jacques*, Maſter Chirurgeon of the ſaid Town, and great Operator and Lithotomiſt, for this Art was at that time very well known through all France. And, which is more, I

have been credibly informed, that the said *Maſt r Jacques* had ſince delivered the ſaid Dame by the ſame *Cæſarean Operation* four Times, ſince that which I have mention'd; which makes Seven in all; but that ſhe died of the laſt.

Your Affectionate Collegue and Friend

Pierre Guenellon.

Having thus diſcourſed, on what Occaſion the *Cæſarean Inciſion* is practicable, uſual and neceſſary, and proved the uſe thereof by divers commendable Examples, as alſo well conſidered the Reaſon of the ſame, it will be proper, further to examine, when there is a neceſſity, not only after what manner this Operation is to be performed, but alſo in what Parts of the Body; and laſtly to conſider, what Danger or Inconvenience may be expected therefrom.

It will then be neceſſary firſt of all to examine the Anatomy of the *Containing Parts* of the Belly, and particularly that of the Womb. Of this may be conſulted *Adrianus Spigelius*, &c.

The common Integuments then, that muſt be cut thorough in this Operation, are the upper Skin, the Skin, the Fat, the fleſhy Membrane, and the Muſcles of the Belly: The innermoſt and laſt Tegument of the *Containing Parts* is the *Peritonæum*, inveſting all the Bowels of the lowermoſt *venter*.

Of the *Contained Parts* of the Belly none is cut but the Womb, to fetch out the Fruit and Secondine.

That the *Containing Parts* of the Belly being wounded, although it ſhould happen that a good Part of the Bowels did ſhoot out, (they being unhurt,) may without any great danger be healed, is to Notorious, and ſo well known by daily Experience, that I think it Superfluous to enlarge upon it; concluding with the Words of *Galen*: *Mediocr foramen anguſtiori ſaluberrime eſſe, ut libere intrudantur inteſtina.*

Nor need you apprehend any great Hæmorrhage in the cutting of theſe Muſcles, in regard that in the Place where the Inciſion is made, there run few or no great Veins or Arteries. Nor need you be con-

cern'd what will become of the extravafated Blood; for it may be conveniently diſcharg'd by the opening of the Womb. Nor is there Cauſe to fear any *Convulſions*, ſeeing that the opening is made in the Miſt of the right Muſcle, and not in its Beginning or End; for in the Middle of it there are none of the ſmall nervous Fibres. Nor need you be afraid of the Largeneſs of the Wound to be made in the Womb, becauſe upon the Extraction of the Fruit ſhe is immediately (according to her Nature) drawn in again; whereupon the Wound is ſoon healed, the circumjacent Parts much contributing thereto; for the Effuſion of Blood of the Womb is not more in this Way of Delivery, than in the other which is natural: And in caſe it ſhould happen to be too great, it may eaſily be remedied by convenient and known Means, both for ſtopping the Flux of the Blood, and for cleaning and healing the ſaid Wound; always taking great care that nothing remain behind that ſhould be brought away.

But that after the Cure of theſe Wounds, by the cutting of the *Omaſum*, there commonly follows an *Hernia* or Rupture that cannot well be cured, which muſt be patiently endured, and eaſed by ſuch Bands as are uſual in that Caſe; conſidering, that this is a ſmall Inconvenience in reſpect of ſo great and difficult an Operation, without which neither the Mother nor the Child could poſſibly be ſaved alive. And we know, that in cutting People of the Stone, the wounding of the Bladder is much more dangerous, troubleſome and grievous, which ſaves but one Body; whereas in our Operation two are preſerved, which elſe muſt be infallibly loſt.

Moreover, it ſometimes happens that this Operation muſt be performed near the Navel, which is a more dangerous Place than that where uſually the *ſectio Cæſarea* is made. And in that Caſe the dead Fruit, and the putrid Bones thereof, have ſometimes been extracted, and yet the Mother recover'd: Witneſs *Stephanus Marialdus* of *Bordeaux* in ſua *Hiſtoria de Partu prodigioſo, qui viſus eſt in Agro Bardiniano* near *Bordeaux*, Anno 1595. which Operation was performed by that very expert Chirurgeon *Jacobus Noërus*.

The

The like happen'd also in my Time, when I was learning the Practice of the Art of Chirurgery, that a putrified Fruit was, by Nature's Co-operation, extracted out of the right Gut.

Albucasis, an eminent Physician and Chirurgeon among the *Arabians*, relates, c. 76. an odd Case, which I cannot forbear to transcribe hither. *I have* (saith he) *seen a Woman, in whose Belly was a Child, and she was then got with Child again; and this second Fruit died likewise. After a considerable Time, she had a Swelling at her Navel, which rising more and more, at last burst, and yielded purulent Matter. Being called to her, I was long employed in that Cure; I laid at length a strong drawing Plaster over the Place, whereby it was so open'd, that one Day there came forth a Bone, and some Days after another. I was amazed, knowing there were no Bones there: But well considering all, I found that they were Bones of a dead Child. Having therefore learned the true Cause of the Disease, and consequently the right Way of the Cure thereof, I extracted many more Bones from thence; whereupon the Woman did pretty well recover, and lived a good while after, though out of the opening there ran always some Matter.*

Franciscus Rosetus recites three Examples more of this Nature, which *Ambrosius Paræus* hath taken notice of in his 24th Book of Generation.

Fabricius Hildanus relates a strange Example of a *Burgundian* Woman, about whose Navel there was cut out a putrified Child, Anno 1609. by Mr. *John Marchandet*, Chirurgeon at *Salines*.

Alexander Benedictus, Chirurgeon of *Bern* in *Helvetia*, relates in his 25th Book, ch. 33. such another remarkable Case of a *Venetian* Woman, which having been deliver'd of a perfect Child, there remained another Child in her Womb, which was dead; which coming to be putrified, was for the most part expell'd the natural Way; but at length Nature making three openings of her Belly, there came forth out of the biggest of the three the whole Skull of the dead Fruit; and after that the other Bones came forth from Time to Time: Whereupon the Woman, by admirable Help of Nature, recover'd.

A. 1663, the 10th of February, there was.

sent me from *Brugges* in *Flanders*, by an intimate and veracious Friend, a Note concerning a very experienc'd Physician called *Dr. Sonnius*, who had performed this *Cæsarean* Operation seven times upon his own Wife, with very good Success, both Mother and Children remaining alive.

Whence appears sufficiently both the practicableness and great usefulness of this Incision for saving of Lives, notwithstanding the Difficulty and Danger which accompanies it: Concerning which that saying of *Hippocrates* must take Place; viz. *Extremis morbis extrema & periculosa remedia sunt adhibenda.*

Yet *Ambrosius Paræus*, a known Author, and *Jacques Guillemeau*, are of Opinion, that this difficult Operation ought not to be used, as you may perceive by their own Words; because they twice miscarried therein, and besides, knew three other Women, that also died under the same. Let this be so; the five Children mean time were preserved, which was no small Matter. But hear what he saith himself.

Some are of Opinion, that such a *Cæsarean* Section may and ought to be practis'd (the Woman being alive) in case of an highly difficult Travel: Which I cannot advise to, having twice tried it in the presence of *Monsieur Paré*, and seen it practis'd by *Messieurs Viart*, *Brunet*, *Carbonet*, very expert Chirurgeons, who left nothing undone that could be done by dextrous and methodical Masters? Yet notwithstanding, of five Women upon which this Operation was made, not one escaped. I know, it may be said, that some have been saved that Way. But suppose that to be so, the Operation is rather to be admired than imitated. One Swallow makes no Summer, nor one Experiment a Science.

The Preparatives requisite to this Operation are, as follows: The Mother and the Child being yet both alive, if I should be called to such an Operation, I should first of all consider all Circumstances, to conclude, whether this Incision were necessary, and whether neither the Woman nor her Fruit could escape Death without it, and whether they had not endured too much by some imprudent or unskillful Midwives, nor the Mother's Body too much hurt by their ill Management: For, if a Woman should chance

chance to die after such an Operation, then the Operator would be blamed, although their former Indiscretion and Ignorance were the cause of their Death. Having then well considered and examined the strength of the Woman, and prepar'd all necessaries for the Operation, viz. an emollient Clyster to discharge the Bowels, and a good Cordial to fortifie the Woman, (I mean a Glas of good Wine;) as also having taken care that she make Water for the emptying of her Bladder, and then having ready a very good Rasor, and another good cutting Knife; a Pen with Printers Ink to mark the Line of the Incision, (which line must be first dried up;) four or five Needles with three-angled Points, stringed with washed red-scarlet Silk, and three or four Silver Needles (such as are used in the Cure of a Hare-mouth,) likewise stringed with Silk; three soft Sponges; several doubled Compresses of soft Napkin-cloth, and a Napkin doubled up four-fold, to be put round about the Belly after the Wound is done up; besides, two broad Swathes, each 6 Inches Broad, to wind about the Belly for stopping the Blood, and above all, a strengthening and sanative Remedy, wherewith the Wound is first to be cleansed and washed, before it be stitched together: To which is to be added a proper Blood-stanching Remedy, wherein there is to be no Vitriol nor any other corrosive Ingredient, for that would hinder the coalition of the Wound: Lastly, a good Wound-balsam to anoint and bind up the Wound with.

The means which I would chuse to perform this Cure with, as to the stanching of Blood, and cleansing the Wound, are the following: First for Cleansing;

R. Rad. Consol. major, Sassaferil. ana ʒʒ. Herb. Agrimonie, Althea, Artemisia, Rorismar. ana m. j. Flor. Meliloti, Lavendulae, Rosarum rubrarum ana m. ʒ. Sem. Anisi, Fenic. ana ʒij. Castorei ʒj. Fiat omnium decoctio in vino rubro, usq; ad tertiae partis consumptionem.

Then, for Blood-stopping;

R. Farinae Volatilis ʒiʒ. Boli armeni ʒʒ, Gypsi ʒij. Resina, Olibani ana ʒiʒ.

Sang. Dracon. ʒj. Omnia subtilissime pulveriscentur & misceantur.

Lastly, for a Wound-balsam;

R. Ol. Olivarum lib. ʒ. Terebinth. ʒij. Rad. consolidae major. Tormentil. an ʒij. Herb. Trifol. odorat. m. j. Flor. rorismar. Centaurii an. m. ʒ. Hyperici m. j ʒ. Croci ʒj. Contundantur simul cum oleo, vitro includantur, & calore solis per 40. dies digeratur; postea exprimatur liquor, & servetur in usum.

Those that cannot get this Wound-balsom made, may safely use the Oil of *Hypericum*, with the Bals. of *Copiva*, of each equal Parts.

All this Apparatus being at Hand, I should then perform this Operation in the manner following;

First of all, having implored God Almighty's Blessing, I should desire the Patient to lie upon her Back, near the Edge of the Bed, for the more convenient access to her, getting two strong Persons to hold her and to keep her Legs close together, and laying a great Pillow under her Head; then I should pitch upon that side of the Belly, Right or Left, which I thought the Soundest, taking care not to meddle with that side which may be affected by some Distemper of the Spleen or Liver: Yet if there should be some Rupture on one side already, in that case *Celsus* and *Paulus Aegineta* do advise to make the Opening in that place where such a Rupture is, because they would not have the Patient endure so much Pain, as he needs must in the difficult healing up of two Ruptures. This done, I should with Ink mark along the Belly the Line of the Incision, to the length of half a Foot, which is the ordinary bigness of the Wound requisite in this Operation; and the traverse Lines drawn over the streight Line, serve only for this End, that in the sowing up no mistake may be committed, soasmuch as the cross Lines must exactly correspond with one another.

But all these Circumstances need not when the Mother is Dead, and the Child supposed to be yet alive. For in this case, I only chuse that place which I judge to be most convenient and safe for delivering the Child and the After-birth with most Speed.

To

To proceed then ; having pitch'd upon the Place, between the Navel and the *Os pubis*, going two or three Inches beneath and on the side of the Navel, and as much from the lower Part, to avoid the tendinousness of the Muscle, I should then make the Opening according to the length of the Belly ; first cutting the Belly quite through with a Razor into the very Fat, and making the Wound so big as is Requisite, considering both the Condition of the Child and the Mother ; and then advancing further, and cutting through the Muscles the Belly, and the *Peritonæum*, underneath of which the Womb will presently appear, which is then to be open'd in the middle with great Caution, that so the Fruit and the Appendages thereof may not be wounded. The Opening being thus made, the Child and the After-birth, with the Navel-string, is to be dextrously taken out ; and in case the Child should be perceived to be Faint, the After-birth is to be sprinkled with warm Wine, and to be laid thus warm upon the Child's Belly to renew its strength. Yet, in case both Mother and Child be alive, I should let alone the separation of the Child till the Mother were dressed, or have a Midwife ready at Hand, to take care of the Child. Then immediately washing the Womb, both to stop the Bleeding, and to cleanse the same with my above prescribed Lavement ; I should instantly proceed to stitch up the Wound, not after the manner of the *Gastroraphia*, in which you take up by turns as well the subjacent *Peritonæum* as the upper Skin, but after the way of stitching up an *Hare-mouth* ; and this I should endeavour to heal up *per primam Intentionem Chirurgicæ*, which is performed by that way of stitching, and the wound Oil. But I should always with a Tent keep open a little place in the lower Part of the Wound, until the great danger and the usual Symptoms were past ; and for the rest, employ such healing Means, as are usual in other fresh Wounds of the Belly.

But as to the Womb, which is not to be stitch'd together, the healing thereof is to be further'd by convenient Syringing, such as may not at first hinder the *Lochia* : But as to *Pessaries*, they, in my Opinion, can do

no good in this Case ; because they cannot convey the healing Remedies so deep as is the place of the Womb (which Syringes can do,) forasmuch as the Opening of the *Uterus* is made in its upper Part. If the *Pessaries* be wrapped about with fine Linnen Rags, or with thin Sheeps-guts, they are the worse for that, to give any Help ; if they be not, they presently Melt, and hinder the Passage also for the Purification : Whereas by Syringing, the pain is mitigated, and inflammation prevented : Besides, that by the use of Syringes the Womb is as 'twere bathed, warmed and strengthen'd ; and by it also the superfluous *Sordes* are expelled.

Concerning the Diet of the Patient, that should be of light and nourishing Meat, I mean, good Broath of Chicken, Pullets, or Mutton, soft Yolks of Eggs, and the like ; in short, such as is usual in great Ulcerations and Wounds of the lower Belly : Taking always great care, that she be not too Costive ; in which case she must be relieved by some Emollient Clyster.

From this way of proceeding, Honour'd Friend, you may judge of those sad Examples, which are daily before our Eyes, of those Child-bearing Women, which not only themselves alone, but together with their Innocent Fruit, are miserably Destroyed. Which Affirmation of mine is confirmed by that Famous Chirurgion, *Guilielmus Fabricius Hildanus*, in a place where he mentions what the Royal Law Imports, saying : *The Royal Law forbids to bury a Woman that is deceased with a big Belly, before the Fruit be cut out. And the Learned in the Law call this the Royal Law, not only by way of Excellency, but also because 'tis esteem'd, that the second King of the Romans, Numa Pompilius, enacted it. Certainly, if this Law were observ'd every where, many Children, which now by the death of their Mothers are miserably Suffocated and Lost, might be saved, to the great Comfort of their Fathers. 'Tis not in vain, that the Author of this Law adds : Those that do otherwise, seem to have killed the Hope of Life with the Fruit.*

But then, though this Royal Law commands to open all big-bellied Women, without any Distinction as soon as they are Deceased ; yet a Chirurgion is not so strictly tied to it, as to obey it in all of them ; because

because there may be manifest and palpable Causes to let it alone. First, When he is sure that the Child is Dead, and that there is but one Child. Secondly, That the Fruit is putrified and dissolved. Thirdly, That there hath gone before a great Flux of Blood, together with the breaking of the Waters, and that the Womb is discharged, and keeps only the Fruit being without any Motion; or when the Fruit is but very little, or comes to no Maturity. Which last was a case that I my self lately met with, having been called to a *French* Woman dwelling upon the *Keyfers-gracht* in *Amsterdam*, to perform this Operation. For, this Woman had so extremely flooded both of Blood and Water, that she had voided (as she her self assured me) near a Pail-full. Finding her Pulse

very Low and Faint, and the Flux continuing, though not so Violent, I bid the Midwife keep her Hand continually upon the Patient's Belly, and to be very Attentive, whether she could perceive the least Motion. But neither before the Mother's Death, nor at her Death, was there any Motion; and being Deceased, I found the Fruit so little, and without all Motion, that I affirmed it was Dead, and very imperfect, and therefore needless to trouble our selves with this Operation.

These, Sir, are the Observations and Practices of the *Sectio Casarea*, which I presume to present unto you; begging your pardon for my Prolixity, and submitting all to your Censure and Correction. Given in *Amsterdam* the 10th of *September* 1662.

A Letter from Abraham Cyprianus, Dr. of Physick, and sometime Professor of Anatomy and Chirurgery in the University of Franequer relating the History of an Human Fætus of 21 Months; taken from the Tubes of the Matrix before the Death of the Mother: Writ to Sir Thomas Millington, Physician in ordinary to the King, and President of the College of Physicians, London.

BEGGING leave of my Reader to wave the Preamble, I shall come directly to the Story. The 17th Day of December in the Year 1694, I was call'd from *Franequer* to *Leewarden* to see the Wife of *Henry Lewis*, a Soldier in Captain *Peterson's* Company: This Woman was 32 Years Old, and the 3d time gone with Child, it being about the ninth Month of Reckoning, without perceiving any thing different from what she used to do, in former Breedings, except that during all this Time she never cou'd see any Milk in her Breasts. Her Burthen appear'd to be heavier and more troublesome to her than usual, especially when the quick Child stir'd it self a little vigorously, and that trouble increas'd when she observed that the *Fætus* was situated something higher than ordinary. But when the time of Delivery or the Birth was come, then she felt great Pains, and the *Fætus* stir'd it self with great Violence, so that she expected the Hour of her Delivery at Hand: But all this came to nothing; for besides the great Motion of the *Fætus* which was made in a part where she was not used to feel it, there appear'd no Efforts to throw it self out, and there was no breaking of Water from the *Amnios*; so that all Hopes were banish'd that they could entertain of a Natural Birth; and then also the Child cea-

fed to move, and the Mother growing by degrees better, every body believed that in that time the Child was Dead.

After Ten Months, the *Menstrua* which had been stop'd during the whole time of the Gravitation, began to flow afresh, and she felt no more Motion of the Infant, but perceived a troublesome heavy Load; this inconvenience increased every Day, but especially towards the Eighteenth Month the Accidents increased to such a degree, that the poor Woman was forced to take her Bed. A little after that she began to complain of a great Pain about her Navel, and the Neighbouring Parts: And this Pain was succeeded a Fortnight before the Extraction of the *Fætus*, with a fungous Ulcer in the Region of the Navel. There were several Consultations of the Physicians and Surgeons, who divided into several Opinions: Some would have it that the *Fætus* was in the *Matrix*: Others denied that; some said it was a Dropic, and others in short said it was an internal Excrescence. It was 21 Months from the Conception of the *Fætus*, when I was call'd from *Leewarden*, attended with the *Sieur Latan*, Professor of Physick my Collegue, and with some Students of Physick of the University of *Franequer*, who with *Monsieur Porcius*, the first Physician of the Prince of *Nassau*, and *Monsieur Simonides*,

Surgeon to the Patient, were Witnesses of this Operation, and the happy Success which we had.

As soon as I had seen the Patient, and had considered all the Circumstances of her past and present Condition; I did not at all hesitate of the Assurance that she bore a dead Child, there being no signs wanting to justify the truth of that: For as I had carefully review'd every Part, I observed that the swelling of the Belly ended in a Point a little below: I then squeez'd and compress'd the Abdomen strongly above and below my Hands, and I then perceived a great Hardness that stretch'd it self to the very *Peritoneum*. We observed this Hardness a great deal plainer at the bottom of the Ulcer, which was Fungous, and easily admitted a wooden Style or Probe into it, by which it appear'd to me that I touch'd something Hard. Afterwards I dilated the Orifice a little, and put in the end of my little Finger, with which I could certainly touch the Parietal Bone of the *Fetus*: Being then embolden'd, and assured of the Situation of the *Fetus*; I declared to them all presently that it was in the right Tube of the *Matrix*, and I let the Patient know that if she would permit me to open her, there was yet hopes to restore her, otherwise that she must perish miserably: Nevertheless the Patient would not be stir'd, or take Sustainance, but was in a word as one Expiring: At last she hearken'd to what I said, and told me she would patiently undergo, whatever I did to remove her Burthen. Having every thing ready for the Operation, I made the Patient be removed on her Bed into the middle of the Room, that there might be liberty on all sides for those that were to assist me, and that all there present might more conveniently behold this New Spectacle, and having disposed the Body to my Mind I proceeded thus.

Having introduced a Stile or Probe into the Ulcer, I open'd the *Abdomen* on the right Side, and put therein my Fore-finger, and when I perceived that I had gotten into the Cavity of the *Fallopian Tube*, the length of the Rectitude of *Linza Alba*, I put my Scissars on my Fingers, and made an Incision on that side as large as I possibly could at one Stroke, then the *Fetus* present-

ed it self all at once, and we might see the proportionate Size. To take it thence without Violence I dilated above and below, and made the Opening about a Foot long, and pressing lightly the Guts with my left Hand, I held them in the Cavity of the Belly that they might not disturb the Operation if they should happen to push forward by the Motion of the *Diaphragm*, and so I took out the *Fetus* entire, without much Trouble: But I used a great deal of Caution to prevent the Guts from descending, by placing the Patient so, that the upper Parts of the Body were something lower, and the poor Woman remain'd almost all the time in the same Situation, till she was totally cured, in order to avoid a *Hernia* or *Rupture*.

Having made an Incision we saw first of all the Head of the *Fetus*, having the Feet stretch'd towards the *Diaphragm*; the Navel-string was also adhering to the *Tuba Fallopiana* by means of the *Placenta*, which was very thin, a good part of it being wasted away; which I observed still more in separating the *Tubes* with my Fingers. The Cavity was all cover'd over with a Mucilage that was like a purulent Matter; but considering a little better: I found that it was not *Pus*, but the remainder of the Water of the *Amnios*, not finding otherwise any internal part ulcerated, or other Matter than the stench in the World. Having likewise taken out the Infant, we came to the place from whence we had extracted it, which is a great Cavity or Hollow, like a very large Purse. I thought it proper to let the Spectators see the Part from whence we had taken the *Fetus*, which was so joyned to the *Peritoneum*, that it look'd like as if it was one and the same Membrane; I let 'em see afterwards that the lower part of the Bag was adhering to the right Side of the Womb towards the Fund, which was the place of the *Tube*, and not being any other part, it is clear that the *Fetus* was in the right *Tube*. Having likewise an occasion and the liberty to see and handle the *Matrix*, I took the Pleasure to show it to all the Assistants in its Natural State, with the Ovary and the left *Tube*, which had received no Damage: And having seen all these Parts, I pronounced boldly and with-

out being deceived, that if the Patient came to be cured, she might prove with Child again.

But to finish this Story: I dip'd a Sponge in warm Water, which I put into the Cavity, and took from thence the *Mucus* that I found: Afterwards having well cleans'd the Wound, I stich'd it up with a crooked Needle in four Parts equally distant, sowing together the *Peritoneum* with the Teguments and Muscles. I had by me for this Purpose a double Thread wax'd, the better to close the Seam. I applied all along the Incision on both Sides a flat Piece of Wood cover'd with Linen, the better to close the Aperture of the Wound; and I tied afterwards the Thread upon the Plate, but not very tight. The Patient complain'd that she had suffer'd more Pain by this Ligature, than she had perceived during the whole Operation. At last I left an Opening towards the lower Part of the Wound, and put in a Tent there, that the Matter which run might find a free Discharge.

Having happily proceeded thus far, I order'd her a convenient Regimen of Living, with liquid Aliments or Food of good Nutrition: And after consulting with Mr. *Simonides* her Surgeon of the Manner of treating her for the future, I left her to his Care for a perfect Cure. The Patient was very thankful to all there present, and very glad to see that the Operation had been so successful hitherto. From this Time she grew better every Day, and gather'd Strength. Besides the Surgeons, she was visited every Day by Mr. *Portius*, Physician to the Prince and Princess of *Nassau*, who provided whatever was necessary for her Diet. I went sometimes to see her, and I found that this Wound was cured after the usual Manner, to wit, by Separation, from whence appear'd within the *Tube Fallopiana*. That which flow'd did not run only by the inferior Orifice, but also by the Intervals of the Sutures: And it made a Separation, not of all the Tube, but only of the internal Membrane; for that which is external is contracted it self by degrees, joining with the *Peritoneum* at the Place of the Incision, and became like a Cartilage by the Hardness it acquired, which I could easily prove by touching it

with my Finger before the Wound was heal'd up.

After such a Section or Operation, which we may in some Sense call *Cesarean*, this Woman was perfectly restored, and went abroad the third Month from the Operation, viz. the 17th of *March*, 1695. from which Time she has continued well, and at present she lives in Health and is satisfy'd. In short, that there may be nothing wanting to so extraordinary a Case, she was happily deliver'd of a Daughter the 2d of *January*, 1696. and the Year following, 1697, she was brought to bed of Twins, a Son and a Daughter; which was a certain Sign, as I had said before, that the left *Tube* was not at all injured, neither had it contracted any Inflammation.

For the greater Confirmation of this Thing, I have caused it to be expos'd to all the Curious, and those who are fond of Novelties, it being now five Years since I took out the same *Fœtus*, which I preserve still entire in a Balsamick Liquor: Nevertheless, I have here given you a Figure thereof, it being a Girl that was of a moderate Size. It is certainly surprizing how a *Cadaver* or dead Body should remain inclosed for 12 Months in the *Tubes* without corrupting; for except on the left Side of the Head and the Shoulder, which was situated opposite to the Ulcer, and was a little corroded by the *Pus*; all the rest of the Body was entire and whole.

As we do not write in this Letter of a Matter that is common, but of a very singular and extraordinary Case, I believe it will not be amiss to consider some Parts that appear'd most remarkable, to draw from thence some Reasons and Conclusions of certain Accidents, and to dwell a little on some Articles of this Letter, in making Remarks by way of Comment. As for Example; *From whence comes it that the Mother never perceived any Milk in her Breasts during all the Time that she bore the Fœtus?* There are some Things that appear absurd not only to vulgar People, but also to Philosophers and Physicians that are prepossess'd; especially those which relate to the Condition of Women with Child and in Labour, which Things (if examin'd with Care) will be found agreeable to Truth and right Reason.

son, though they have been taken for absurd.

In the present Case, it appears at first Sight incredible, that a Woman should carry in her Womb a living Burthen, and yet that there should be no Milk; an Opinion founded upon a false *Hypothesis* of those who believe that the Milk comes from the Breasts into the Womb for the Nutrition of the *Fetus*, or upon the *Hypothesis* of those who are of Opinion that the Milk is generated in the Breasts from the Retention of the Menstrual Blood. It is likewise a common Notion, that a Suppression or Stoppage of the *Menstrua* in Girls who are debauched is a Sign of being with Child. They say likewise, that if a Woman do not perceive her Child stir, it is a Sign that it is dead, and that an Infant born in the 8th Month cannot live; with many others of the like Nature, which Reason and Experience overthrow.

It would be too long to detain you with what Account Authors give on this Subject: I shall therefore only relate you a Story told me by a very curious Man, and one worthy of Credit, that justify'd what I am going to say. He said, he knew a young Woman of a very good Family, who being got with Child by her Gallant, did whatever she could to destroy it about the 5th Month of her Gravitation, by all Sorts of Medicines which old Women and Nurses could invent, by Abundance or Bleeding and Purging; so that in short the Thing went so far, that she felt the Child stir no more, but it appeared to her like a Lump of Lead, falling down upon the *Pubes*; that the Breasts flag'd, and the Milk disappear'd. This Woman, in a great Concern how to get the Burthen out of her Womb, which she believed to be dead, consults a Physician, and told him ingenuously, that she had used her utmost Endeavours to kill the Child: But he order'd her to use a good spirituous nourishing Diet, to take her Rest, and to abstain from all Purgatives, and other Evacuations; which having obey'd, the Infant began to stir afresh, and came happily to Light about the tenth Month. This Case shows us, that the Sinking of the Breasts, the Absence of the Milk, and the Cessation of Motion from the Child,

are, not always true Signs of *Abortion* or a dead Child; but that they indicate only a Weakness or Disorder of the *Fetus*.

From hence it appears plainly, that the Opinion of the Ancients is false, who believed that the Milk was generated from the Retention of the Menstrual Blood, that the *Fetus* was nourish'd from Milk, that the Want of Milk is the Cause of Abortion, and that Milk in the Breasts is a necessary Conclusion that the *Menstrua* do not flow; for Experience informs us, that Women, who through Fear or some other sudden Cause are injured, are not for that Reason void of Milk: And if Women who are damaged only by Weakness do not perceive that they breed Milk in the Breasts, that comes from this Reason, that the Cause of Weakness, and Abortion which follows it, is the same which stops the breeding of Milk, to wit, a certain Dryness and Want of Juices, which are necessary to the Support of all the Parts of the Body. For that which has relation to the Reason for which in the present Case this Woman did not perceive in her Breasts any Milk all the Time that she was with Child, it is likely we may assign it to a certain particular Analogy and Sympathy of the Womb with the Breasts: For if before having been twice with Child, she wanted no Milk, but instead thereof in this Case she had none all the Time the *Fetus* was in the *Tubes*; 'tis for this Reason, that what contributed the more to the Generation of Milk, to the Growth and Plenty, was the Occasion that the *Matrix* became so very big, especially towards the End of the Gravitation; that the Vessels which were towards the lower Parts were compress'd more than usual, and that by this Compression the Blood rises in greater Abundance towards the upper Parts.

For as the Blood resorts more plentifully into the Parts, it makes a much greater Separation in the fatty Cells of the Breast which separate the Fat, and in those other Glands which separate the *Lympha*: And this Separation renders the Vessels more open and proper to let pass the Matter or Supply for the Milk, to which also contributes the Suction, Friction and Imagination of the Mother that suckles; all which Things meet-

meeting together, the Vessels at once open and dilate, maintaining themselves in the same Condition, although the *Matrix* be sunk, and the Vessels be not compressed. This being granted it appears clearly from what cause the want of Milk, comes in the present Case. Namely, from the Fruit of the Womb being lodged in the *Tube*, and being consequently placed on the Side, could not as usual compress the Blood-vessels which pass on the lower Parts, and so could raise not the Blood to the upper Parts of the Body more than at other times; and as the separation of the Milk is made by Compression of the Arteries, so the swelling of the Legs comes from the Compression of the Veins; for the Motion of the Blood being retarded, is the reason that the *Lympha* is separated into the Adipous Glands, throughout the whole Body, as it appears in an *Anasarca*.

We may frequently see Milk in the Breasts, of those who are not with Child, as Infants and old Women, and sometimes likewise in Men. *Diemerbroeck* gives us a remarkable Story of an old Woman who suckled her Grand-Child at the Age of Sixty and Six. I have seen many Men who have had Milk in their Breasts as plentiful as most Women; for the Parts necessary to breed Milk are throughout the same in both Sexes; to wit, the Adipous or fatty Cells, which separate the Fat from the Blood, by the structure of their Glands, and also the Glands which separate the *Lympha* from the Mass of Blood; for we believe that the Milk is nothing else but a Mixture of Fat, or oily Parts with the *Lympha*, as may appear from the Cream that is afterwards converted into Butter, by separating it from the *Lympha* or *Whey*. All this, nevertheless, does not hinder the Compression as alledged of the Vessels of Blood from the Womb, from being the true and sufficient Cause of the Generation of Milk at the times of Gravitation: For we may sometimes see several Homogeneous, Subaltern, and Auxiliary Causes, which tend to one and the same End, and which are not at all opposite to one another.

That we have found a Fætus in the Tubes.

After having observed the great Analogy

that there is betwixt the Parts which serve for the Generation of Men, and of other Animals which have Eggs: And after finding sometimes a *Fætus* in the *Tubes*, in a Body opened as we have seen in a living Woman, is there any Person that can farther doubt, that the *Tubes* of the *Matrix* are the Conduits or Pipes by which the *Fætus* passes from the *Ovary* to the *Womb*. But at present I believe it will be necessary to examine what the Cause is, why the *Fætus* being descended into the *Tube*, is not always push'd forward into the Cavity of the *Matrix*, but sometimes stops in the *Tubes*, and there acquires or gets its due Size and Growth. We take this to proceed from two Causes, the one *Natural*, and the other *Accidental*: I call that *Natural*, where the *Tubes* by an ill Natural Conformation, are not open towards their entry into the *Matrix*, or so strait that the Wind cannot pass through them, so as to penetrate into the Cavity of the *Matrix*. The *Accidental* Cause is, when by some Accident that happens, as after a difficult Labour, or by some other Cause that succeeds, the *Tubes* are seized with some Inflammation; from whence it happens that their Aperture is closed, and their Passage into the Womb shut up. For all the Parts, especially the Pipes and Canals of our Bodies when they are deprived of the Humour which used to moisten them, soon dry up, and are shut: So the *Tube Fallopiane* having an internal Tunicle or Coat covered or spread with Glands that are appointed to discharge a Liquor to lubricate their Passage; and to prevent the Parts from agglutination or growing together, so that by them the Eggs which are once drop'd might pass easily into the Cavity of the Womb. If then there happen an Inflammation in this Part or *Tube*, by some Accident, or some Foreign Cause; this Inflammation stops the free separation of Liquors which is made in the Glands, which occasion an Agglutination of Parts. Those Cases which happen from some foreign or unknown Cause, are sometimes occasion'd by the Fault of those who assist Women in Labour, especially when the *Afterbirth* sticks more than usual; they rear all before them in pulling too hard at the Navel-string, not knowing the true way

of separating these Things: Which makes that sometimes they pull down the bottom of the Womb, and consequently do violence to the *Tubes*, and other Parts joyn'd to them, from whence necessarily follows an Inflammation. Or else the Conglutination and Contraction of the Vessels is the effect of the Inflammation, as all those observe who have open'd many Bodies. Likewise we see after a *Pleurisie* that the Lungs stick to the *Pleura*, at the place where the Inflammation happen'd, in the same manner after great and frequent Injuries of the Belly, the Guts stick together, and sometimes adhere to the *Peritonæum*.

Or we may observe that the *Fallopian Tubes* do not close or stick together, only towards their entry from the Womb, but are curbed also towards their Extremities, which are more Open. That which I have occasion to observe is in a certain Woman who being taken in Labour the fourth time, and suffering a great deal by reason of the difficulty of her Delivery, or rather more from being assisted with an ignorant Midwife, who pull'd away the *Asterbirth* too forcibly, it being strongly fixed to the Womb, she perceived or felt great Pains at the bottom of her Belly, especially about the Kidneys, which continued Fifteen Days together, as if it would have kill'd her, without hopes of Recovery. But being very strong and able to undergo the Pains, she happily escap'd contrary to the Expectation of the World, after the necessary Remedies, and lived Ten Years after that. She felt continually a great Weakness upon her Reins, and from that time was Barren.

This Woman dying, and having accidentally an occasion to be opened to enquire into the Cause of her sudden Death; I found then that the occasion of her Barrenness proceeded from hence: namely, the Conglutination, Sticking together, or Contraction of the curled extremity of the *Tubes*, caused by Inflammation upon the adjacent Parts of the *Matrix*, after the last difficult Labour, in which she had been so ill treated.

It appears evidently from this Case, and by the like, how pernicious it is in a difficult Labour, to make use of ignorant or unexperienced Midwives, Physicians or Sur-

geons, since those who survive the Operations of such, so commonly suffer by Accidents of this Nature, and what is more mischievous they accompany them to their Death-beds. Besides, this ill treatment of Deliveries leaves yet another fault in the *Tubes* which hinders the curled part from joyning to the *Ovary*, so that the Eggs cannot descend into the *Matrix* to wit, the *Paralysis* of the moving Fibres which externally embrace the *Tubes*, and which serve for the Peristaltick Motion. This inconvenience, I say, is easily produced by the Cause, I have mentioned, to wit, when the Nerves close and become usefess in performing their Functions in the Part where the Inflammation is present.

After having discover'd the Causes which makes the *Fetus* sometimes lodge in the *Tubes*, and not proceed into the *Matrix* or Womb; it remains to examine how the *Fetus* is fasten'd with the *Placenta*, from the internal Tunick or Coat of the *Tubes*, and how it gains its growth from thence after the same manner as it doth in the *Matrix*: To understand this the easier, I propose first of all, my Opinion of the Manner, how it is performed in the *Matrix*, and afterwards I shall let you see the Analogy that there is betwixt the Womb and the *Tubes*; so that you may clearly know how the *Fetus* grows in the *Tubes*. After so many great Men have endeavoured to explain and clear up the Generation in an Egg, and that they have sufficiently demonstrated it: It is not likely that there should be any room for doubt, since it is certain that the *Fetus* in the Egg is push'd out of the *Ovary* by the *Fallopian Tubes*, into the very Cavity of the *Matrix*, having along with it all the Parts finished, and inclosed with its Membranes and the *Placenta*, which ought to stretch and extend themselves according to the first *Idea*, and in the first Formation, and that afterwards being descended it remains there, and takes its growth: Or there is a probability that the growth of the Egg proceeds from the same place to which it is fasten'd, whether it be to the *Matrix*, or the *Tubes*; since this Egg contains nothing in it self so much of the Substance, which is necessary for the Nutrition of the growing *Fetus*: Of which we see every day the contrary in Animals that are

are made properly from Eggs, which contain as much room in them as is necessary for all the Matter that is made use of for the growth of the Chicken inclosed in the Shell: That the *Fetus* then may receive from the *Matrix* the Humours that are necessary for its growth; it ought to be fasten'd, or rather as it were glewed to it, in such a manner that there be form'd from thence small Pipes or Vessels, which coming from the *Womb* or *Fetus*, the Humours and Blood may be communicated backwards and forwards, from one to the other.

It may appear difficult to explain how this adherence is made, or how this gluing together of the *Afterbirth* with the *Matrix*; but I shall in few words give my Opinion of this Matter: We have seen by experience that after the Eggs have remained some days free and moveable in the *Womb*, without being fasten'd, their outward Surface, especially at the part of the *Afterbirth*, becomes Hairy, and is made up of small floating Filaments, that are like very fine Moss; these fine Threads that presently adhere to the Surface, are moisten'd by the Humidity contained there, and unfold or spread themselves when the Egg is come at a place where there is more room, to wit, in the Cavity of the *Matrix*. I think that these Filaments ought to be taken for the small Pipes that serve to receive an Humour, as the small Fibres that are in the Roots which convey the nutritious Juice of the Earth to the Body of a Plant or Tree: Else these Pipes or Vessels serve necessarily to receive the Humours that are naturally separated in the internal and glandulous Surface of the *Matrix*. But this happens particularly when the Egg is come by the internal Motion of the Humours to that pass, that it is shut up, and of such a Size, that it compresses the adjacent Sides of the *Womb*, when the internal Cavity of it, is not ordinarily larger than a great Bean. It happens from this reciprocal bearing upon one another, which is done with some Compression that the external Surface of the Egg, which is as it were peeled or bare, sticks or hangs it self to the internal Surface of the *Matrix*, and especially to the part of the *Placenta* or *Afterbirth*, and that a part of the Pipes or Vessels which are in the Egg, to wit, of

those which are necessary for this purpose unite themselves, with the separating Vessels of the Glands, whose internal Coat is derived from the *Matrix*: From whence it happens that their Conduits become continued after the same manner as we see other parts are united together; as for Example, the Cheeks with the Gums, when one or other of them are Ulcerated. But it would be needless to waste more time in proving a thing that appears so clear from several Examples of the like Nature. We may suppose that these Filaments or small Pipes insert themselves into the Veins of the *Placenta*, which are afterwards form'd into the umbilical Vein, in the same manner that the Lymphatick Vessels which, by the oblique Pores without and within, enter into the Veins, and convey all the Humours that are in the Trunk of our Bodies. For it is certain that all these Humours that are thus separated return into the Mass of Blood: Likewise the *Lympha* which continually flows from the internal and glandulous Surface of the *Peritonæum* to facilitate by that the Motion of the Parts therein contain'd, and to hinder that they unite not, or stick together, returns into the Veins that are dispersed through the whole, into the Cavity of the lower Belly, and upon the Surface of the Membranes; and when these Conduits or Vessels are stop'd, we regard it as the common Cause of a *Dropsie* call'd *Ascites*. 'Tis after the same manner, that the *Lympha* which is separated in the glandulous Membranes of the Brain, and which is contained in the Ventricles and Interstices enters again into the Blood. 'Tis the obstruction of this return that a *Hydrocephalus* is incident to Infants, because they suffer a great Dilation, from the stoppage of the *Lympha* in the Interstices of their Membranes: But in Persons of an advanced Age whose *Cranium's* are not so subject to Extension, when the Circulation of the Blood is impeded, there happens a Mortal and incurable *Apoplexy*: The Brain is found compress'd by the too large quantity of this Liquor: In short we may from the same way of reasoning, trace the cause and Origine of most Diseases.

In the 3d Figure we may see the *Tubæ* with the *Womb* of a very extraordinary Size.

Size, and the spermatick Vessels form'd after an unusual manner, with double Ureters. I shall give the History of this case in as few words as I can, and only what relates to our purpose. The Daughter of a certain Burgeſs, of a moderate Fortune, was married with a Gentleman: But the inequality of her Condition being made known to her Husband's Friends, they obliged him to forsake her, so that she was obliged to live at *Amsterdam* for some Years, accompanied with Melancholy and Poverty. After some time the Husband return'd, and going to see her, he promis'd to restore her to her former State: Upon the new Careſſes of her Husband, this Woman grew big with Child, and she was confirmed the more daily in that Opinion by the swelling of her Belly, and the Suppression of her *Menſes*. Nevertheless the Husband's Parents hearing of this, made him change his Design, and so alienate himself from her, as never to see her again. This last absence of her Husbands, or rather this abandoning her, being much rougher than the former, so afflicted the poor Woman, that during all the time of her pretended Gravitation, she remained perpetually Sad, and Melancholy being fill'd with Grief. In short, after Nine Months were gone there was no Birth; nevertheless the Midwife who came to see her, believed her to be effectually with Child, although she never felt the Motion of the Child, assigning for reason that the *Fetus* was affected as well as the Mother, and that it was the weakness arising thence, that hinder'd it from stirring or turning it self. After some time was gone and there was no Delivery, they believed it was a *Dropsie*, and for two years together took Medicines against the *Dropsie*, but to no purpose. When she was obliged to keep her Bed, and that the Size and Tumour of the Belly grew frightful, I was sent for to make the *Paracentesis*. But having seen this Woman in such a Condition I wou'd by no means undertake the Operation, having always been of opinion that it was Rashness to attempt the Operation of the *Paracentesis* in a confirm'd *Dropsie*.

The Woman dying some days after, I opened the Body, and found a little or no quantity of Water in the Cavity of the

Abdomen, all that prodigious Tumour or Swelling being nothing but one of the *Tubes* of the Womb extraordinarily Inflated and Big, which contained 150 Pints of Water, that were taken thence: But for the better examining of the whole with more exactness, I carried this Tumour with the *Matrix* joyn'd to it, having leave granted me, Home; whereof I caused a Figure to be drawn by the Life, and have given you a Description along with it. The Membranous Substance of this *Tube*, after the Water was taken out, weigh'd above 30 Pounds.

One part of this *Tube* we may take a view of in the 4th Figure. It appears of various kinds of Substances, to wit, *a, a, a*, are *Carcinomatous* Tumours form'd of a matter contain'd in the Glands of the *Tube*, for we know no other difference betwixt a Scyrrhus, Cancerous or *Carcinomatous* Tumour, and another Tumour which degenerates into an Abscess, but that the Matter which makes the Cancer is a Liqueur separated and continued in the Body of the Gland, without being mix'd with any other Humour; by the obstruction of the Vessels which serves for the separation of that Liqueur, by which it encreases continually, and not flowing by reason of the hardness of the Membrane which incloses the Gland, so that finding no other Way or Passage to return into the Blood it cannot resolve, but thickens and makes the Gland Harden, and consequently cannot give room to digestion or dissipating the Matter that is contained therein; from hence it comes there is no Pus arises, for it never changes its Substance; *b, b, b*, is the *Lympha* into the Belly, which is separated in the Glands of the *Tubes*.

Before we leave this Story, I design to give you my Opinion upon the cause of the extraordinary size of this *Tube*: I do not dispute this Woman's being gone with Child, and that the *Fetus* was not stop'd in the *Tube*. But the *Fetus* being Dead, the Blood is carried in great plenty towards that Part, and the Vessels being found in some measure much Dilated, there is a great Motion of the Blood towards the Glands, where the internal Tunick of the *Tube* is spread throughout the whole, by which means there is made a continual separation of the *Lympha*; which in short, produces
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Fig: I.

The Fetus as taken out in the Operation.

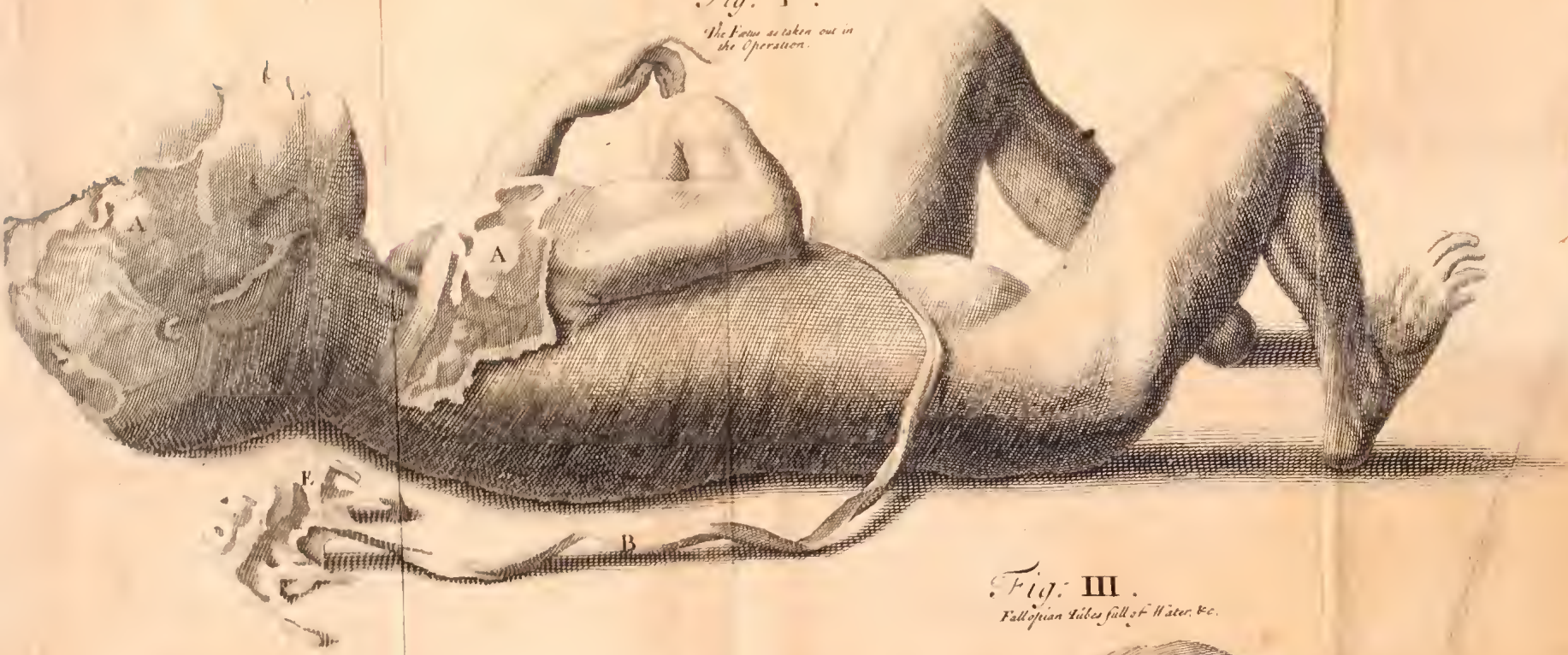


Fig: II.

A The bottom of the Uterus.
BB Fallopian Tubes.
cc the extremities of those Tubes, fig 2.

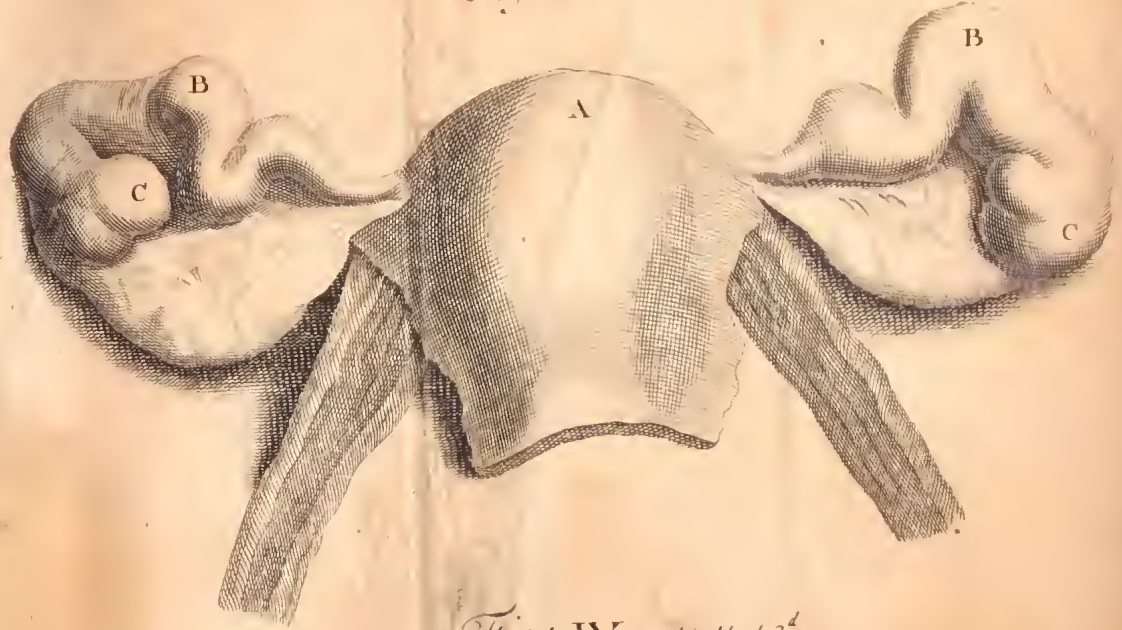


Fig: III.

Fallopian Tubes full of Water, &c.



Fig: IV is explain'd by the 3^d



this *Dropsie* of the *Tube*, by reason that this *Lympha* cannot find any Road to re-enter into the Blood, and that the Insertion of the *Tube* into the *Matrix* was shut up; which is seen in the third Figure, where the *Matrix* appears closed on the side of the *Tube*.

The first Plate or Figure represents the Fœtus as it appear'd in the Operation.

- A. A.* The PARTS excoriated.
- B.* The Navel-string dry'd.
- E.* The After-birth.

The second Figure is explain'd in the Copper-Plate.

The third Figure.

- A. A. A.* The right *Fallopian Tubes* full of Water.
- b. b.* The two *Cavities* of the *Matrix*.
- c.* An *Isthmus* betwixt the two *Cavities* of the *Matrix*.
- d.* The Internal Orifice of the Womb.
- e.* The left *Fallopian Tubes* which are betwixt the two *Cavities* of the *Matrix*.
- f.* The Bladder.
- g. g. g.* The *Ureters* double on each side.
- h. h.* The *Spermatick Arteries*.
- i. i.* The *Spermatick Veins*.
- l.* The *Spermatick Vein* coming from the Kidney.

Of Fevers in General; From D. Gagnon Sieur de Saintigny, Mr. Chaillon, Wallis, Morton, Sydenham, Carleton, and others, the most Famous Physicians of the last and present Age.

IT is the Custom of *Mathematicians*, when from a Series of propositions, premised and verified they have inferred the Conclusion they sought, to add, certain useful *Theorems*, called by the *Greeks* *επισήματα* or *Corollaries*: The knowledge of which is many times of equal Moment with that of Verity, on which they depend. Give me leave then so far to imitate this Method of those great Masters in the Art of reasoning rightly, as to lay down a few *Pathological Corollaries*, such as may perhaps afford some glimpses of Light toward the Discovery, Nature and Causes of a certain Disease, which is of all others incident to Mans frail Body, the most common, most grievous and most dangerous: For the subject of this present Tract is not only a Speculation, but tends to the finding out the most probable causes and reason of curing the said Disease, as the principal scope and end of all our Enquiries, as well *Physiological* or *Anatomical*, of which none can be ignorant who hath perused that little Book of *Hippocrates de Prisca Medicina*, wherein he teacheth, that it is the great Duty of all Physicians, who desire to render themselves worthy of that honourable Appellation not by discourse alone, but also by their Works, and succouring of the Sick, to be solicitous about investigating the true Nature, Causes and Remedies of Diseases, above all things.

Nor is it new to find in the Writings of Anatomists, Pathological Reflections subjoin'd to the description of the Part, which is known to be the primary Seat of the pre-

ternatural Affections incident thereunto. I shall therefore premise this, that the vital Heat or Motion of the Blood doth formally consist in a certain expansive Luctation of the spirituous Particles thereof, with the less moveable or unactive, repulsed and prevailing alternately; but mild, amicable benign, and conducing to the exaltation of all the Faculties and Uses of the Blood. Now I come to add that it is not only possible, but that it often happens, that this Vital Motion, although proceeding only from the Spirits that conserve and rule the Blood, is by causes beside the institute of Nature invading it, *perturbed, interrupted, perverted*, and sometimes also wholly *extinguished*: The vital Oeconomy being thereby sooner or later utterly subverted. Of this we have instances almost innumerable. Nor is there any one kind of preternatural Causes assignable, by which Nature may not be impeded in her production of this Vital Motion, and more or less Perturbed: As we cannot but observe it within our selves to come to pass, sometimes from the immoderate Heat of the Air surrounding us, as in *Ephmera*; sometimes from Meats and Drinks potentially too Hot, as in Surfeits and Drunkenness; sometimes from vehement Passions of the Mind, as in Anger, Fear, Grief, &c. Sometimes from a fermentation of the Blood, as in putrid Fevers; sometimes from venenate *effluvia* of Bodies, as in pestilential and contagious Fevers; sometimes from a simple Solution of continuity of the Parts, as in Wounds: So that

that in Fine, to enumerate all the various Causes, by the Hostility of which this Life-conserving Work of the Vital Spirits, may be hindred and perverted, is a thing extremely difficult, if not plainly impossible. But in all these so various Cases, this is worthy to be Noted, as a general Verity; that the Vital Spirits of the Blood are always *preternaturally* Affected, and that the disorder from thence Emergent, ought to be imputed to a *preternatural* Cause. Every thing then that *pollutes* the Blood, and that puts Nature to an Effort or Essay to separate and eject from thence, as Alien and Hostile; is wont more or less, according to the diversity of its Nature and Malice, to impugn and repress the Vital Motion of the Blood. But nothing hath been observed to do it, either more frequently, or more continuaciously, than *impurities* arising from *Crude Humours* congested in the Mass of Blood, which cannot be separated and extirpated without previous Concoction or Digestion. For, these constituting a certain peculiar *Inquinament* or Pollution of the Blood, put on the Nature, and acquire to themselves the efficacy of a *Ferment*; not indeed such as the Leven of Bread, or as the Yest of Ale or Beer; but such, that being in our Bodies mix'd with the Blood, which perpetually conceives new Vital Heat in it self, produceth the like Commotions therein, that those domestick Ferments do in their respective Subjects; and may therefore be not unfitly called a *Ferment*, according to the Name given to it by all Modern Physicians.

For, it causeth a manifest Tumult, or intestine War in the Blood, after this manner. The *inquinament* of the Blood, by reason of the Crudity and Viscidity of its Parts, impugns and hinders the benign expansive Motion of the Spirits, in which I have declared the Generation of the Vital Heat of it to consist: And the Spirits, on the contrary, by their natural tendency to expand themselves, oppose that repressive Force, and strive to defend themselves from Oppression; producing by their Energy, a continuation of the Mication of the Blood, imperfect indeed, and mix'd with Fermentation, but the best they are able, till they have gained the Victory, to produce. So that the Fermentation of the Blood in Fevers, seems to

proceed, not from the impurities mix'd with the Blood alone; but partly from them, and partly from Nature, *i. e.* from the Vital Spirits conserving the vitality of the Blood. For, while *these* are impugned, check'd, and hindred, by *those*; the Motion resulting from that Conflict, is indeed a certain Mication of the Blood, but Tumultuous, violent, unequal, and interrupted with little Bubbles and Froth. I say therefore, that this Civil War in the Blood, as it includes a certain Vital, though imperfect and irregular Mication of the Blood; cannot be denied so far forth to be the Work of Nature: But as that Mication is supposed to be Tumultuous, Seditious, Hostile, and unequal; it must be, in that respect, the product of the Fermentation arising from the Inquinament or Corruption of the Blood.

This *Fermentation* certainly is the very same thing that the Ancient Physicians meant by the *Putrefaction* of the Blood in Fevers: Calling, for distinction sake, all such Fevers, which they conceived to arise from thence, *Putrid* Fevers. For it is not credible, that Men of so acute Judgment, and so curious in observing, and their Writings declare them to have been; by the Word *Putredo*, intended to signifie that sordid and noylom Corruption observed in dead and rotting Carcases, which is absolutely inconsistent with the Principles of Life; but only a more mild manner of Dissolution of the Blood, and such as doth impugn and hinder, but not wholly suffocate the vital Expansion of it. And of this we are certain, that they used to affix the Epithet, *Putrid*, to whatsoever doth by a swift Motion degenerate into the Nature of *Pus* or *Quitter*. Which is generated, either slowly, by degrees, by a gentle and long process, and also without Tumult; as when any Humour is, without a Fever, digested and converted into purulent Matter: Or speedily, and with great Tumult and disorder of the State of the Body; as in putrid Fevers, when the *Materia Febrilis*, or inquinament of the Blood hastens to Concoction, and the Disease runs through all its Times quickly and swiftly. Of these two so different ways of producing Purulent Matter in the Body, the *former*, which

is always simple and without a Fever; is called by the Antients; *παραποις*, *Maturation* or *Ripening* of the Matter: The *Laxer*, which is always with a Fever, is called *Σαρεία ὁμαρίτης*, *Putredo*. Whence that Aphorism of Hippocrates (lib. 2. aph. 47.) *Dum pus conficitur, dolores atq; febres incidunt magis, quam jam confecto.* In their Sense therefore, *Putredo*, is the very motion of the matter of a Fever tending to Purulency: And this Motion is the very same; that most *Neotericks* Name *Fermentation*. For, in Fevers, it is the Fermentation that brings the impurities to Digestion or Concoction, and disposes them to separation from the Blood: And therefore the *Putrid* Matter, and the *Fermenting* Matter signify one and the same thing; and by consequence, the *Materia Febrilis*, and *Fermentum Febrile*, are but two different Names of the Cause whence the Fever or Fermentation of the Blood comes. Now if this be granted to be consentaneous to Reason and Experience (as to me it seems to be) we need no longer amuse our selves with inquiring, either wherein the formal reason of a putrid Fever consists, or how those two Enemies, *Life* and a *Fever* can subsist together in the same Subject, the Blood; for what I have said may serve to expound both those Riddles.

Considering therefore in the firmness of this Foundation, I design to erect thereupon a short *Theory*, of the Nature, Causes, Differences; and principal Symptoms of *Fevers*; and that according to the *Model* left to us by that most accurate Surveyor of Nature's Works, Dr. Fr. Glisson, in his last incomparable Book; reputing it well worth my Diligence, to paraphrase upon the Text of so great an Author.

And because to Physicians accurately investigating the differences of preternatural Causes inducing Fevers, there occur to be considered more than one Kind, as of *Crudities*, so likewise of *Ferments*; that I may not leave my self sticking in the shallows of Ambiguities, 'tis requisite that I clear and distinctly explain; first what I understand by *CRUDE HUMOURS* commix'd with the Blood. Which I take to be generally the *Material* Causes of putrid Fevers; and then, what I mean by the *Fermentum*

FEBRILE, which I suppose to be the *Efficient* Cause of them; for by this means, the Fog of Equivocations being discussed, we shall by a clearer light of distinct Notions, contemplate the Nature of the Things sought after.

As to the *First* thereof, viz. the *Crudity* of Humours; 'tis well known; that Physicians observing two kinds of *Concoction* or *Digestion* performed by Nature in the Body, viz. One of what is *Natural* and *Familiar*, of the *Aliment* requisite to the continual Reparation of the Body; which they call *πείσις*; the other, of what is *Preternatural* and *Hurtful*, as the material cause of Diseases; which is named, for distinction sake, *παραποις*: Have accordingly constituted two sorts of *Crudity*, one *Alimenti*, the other *Inquinamenti*. Of which the former, that respects Nutrition, is ordinary; arising for the most part from some error committed in the use of the six Non-naturals, and consisting chiefly in this, that the Spirits of our Food are either not sufficiently excited, or if excited, yet not sufficiently tamed and subdued by the concoctive Faculty of the Stomach, to serve to promote the vital Mication of the Blood.

The *Later*, viz. *Cruditas inquinamenti*, is in the general, any pollution or corruption of the Blood whatsoever, arising from defect of its due preparation and fitness to admit the vital Mication. And this, being the Mother of Fevers, is that intended by Hippocrates in that most remarkable Aphorism; *Concocta medicamento purgare ac movere oportet, non cruda.*

This *Crudity* is subdued into two sorts; one *Simple*, which consisting only in defect of due preparation of the Blood, may be corrected *per pepasum* or maturation, necessarily previous to Evacuation either Natural or Artificial: The other *Malignant*, which always includes certain seminal Reliques of some precedent form of the Matter mix'd with the Blood, highly hostile to the vital Spirits, and incapable of Correction or Mitigation, and many times of Expulsion. Now from this Malignant *Crudity* of Matter mix'd with the Blood, ariseth a *Malignant Fever*; and from the simple *Crudity*, comes a *Putrid*. Of both which

we shall speak more Copiously, when we come to consider the differences of Fevers.

As to the *Second*, viz the difference of *Ferments* incident to our Bodies; I Advertise, that they also may be (as to my present Disquisition) commodiously referred to two Kinds. Of which the *one* may be called *Fermentum irritans*, because it doth primarily, by it self, and directly irritate the vital Spirits of the Blood; to begin an extraordinary Commotion, and seditious Tumult, with the grosser Parts of it; and to endeavour to deliver themselves from Confinement, and by dissolving the common Bond of the whole Mass thereof, to fly away. And under this kind are comprehended all fermenting Mixtures abounding with saline Spirits, highly Volatile, and not easily tameable by the digestive Faculty of the Stomach: Among which the *Stum* of Wine is Eminent.

The other deserves to be named *Fermentum Opprimens*; because it at first and immediately oppresses the vital Spirits of the Blood, impugning their expansive Motion; though afterward, secondarily, and by Accident, it irritates them to a *Pneumatick* Fermentation; not to dissolve the whole Mixture thereof, and so to make way for themselves to fly away: But only to attenuate, discuss, eject and exterminate the Ferment, that by clogging and oppressing them, hinders their spontaneous Expansion, and the vital Mication of the Blood thereon depending. And this to me seems to be that kind of Ferment, by which a Fermentation of the Blood is wont to be excited in putrid Fevers; and which for that very Cause, ought to be nominated *Fermentum Febrile*. It seems also to consist of any crude Humour whatsoever commixt with the Mass of Blood: For, this doubtless is that *Crudity*, which *Hippocrates* (in the newly cited Aphorism) forbids to be importunately attempted by purging Medicaments, until Nature hath mitigated, tamed, and prepared it for Evacuation, by gradual Digestion.

Of which Counsel, though many reasons have been, by the learned Commentators on his Aphorisms, chiefly by *Cardan*, alleged; yet the most credible, and therefore the most considerable seems to be this; That Nature hath provided no Organ for the Separation

or Secretion of such Crude Humours from the Blood, the Spirits of which are not yet exhausted.

Most true indeed, and evident it is, that Nature has with admirable Wisdom and Providence taken care to preserve the Blood Pure and Undeiled; and to that end framed, and most advantageously placed three conspicuous *Secretory* Organs, for the purification of it, viz. the *Liver*, *Kidneys* and *Stomach*, with the conjoin'd *Intestines*: And yet it is no less true, that none of these is, by her primary Institution destined to separate and drain from the Mass of Blood, any Matter yet remaining in the State of *Crudity*, or not yet despoil'd of its Spirits; but all three ordained, lest the Blood, after it hath spent and consumed the sweet and profitable Spirits of the Aliment, and becomes thereby Effete and Ungenerous, should be longer detained in the Body; and like a dead Body bound to a living, pollute and infect the Blood newly made of a Chyle lately imported, and replenish'd with sweet and useful Spirits.

Now the Humours here by us supposed to be both the antecedent and conjunct Causes of Fevers, are not such as have already been spoiled of their Spirits, and apt to turn Vaprid; but such as abound with Spirits yet Unvolatilized, and infect to the vital Mication of the Blood. For, the Matter not sufficiently digested, altered, and elaborate in the Stomach, becomes at length apt to produce Fevers, in this respect only, that the Spirits contained in it, are either not sufficiently Excited, or not sufficiently subdued and tamed. Likewise the Matter that grows crude, and apt to generate Fevers, either from defect of due Eventilation, by insensible Transpiration, or from want of free Motion, is not Vitious, because the Spirits of it are already dissipated, but only because they are, contrary to the institute of Nature detained, and because they at the same time impede and somewhat suppress the vital Mication of the Blood. In fine, the *Semina Heterogenea*, unalterable reliques of some precedent form remaining in the crude Matter commix'd with the Blood, cause a *Malignant* Fever; because the Spirits of that matter have been already Exhaled, but because they are Hostile, highly insensate and

pernicious to the vital Spirits, and incapable of being tamed. We have Reason then to believe, that the material Causes of Fevers are not the dead, useleſs and excrementitious Parts of the Blood; not the *Phlegm*, nor the *Bile*, nor that thin Humour conſiſting of the *Serum*, Salt and Tartar of the Blood, which is ſeparated in the Kidneys; for all theſe have their peculiar ſecretory Organs, by which they are daily ſeparated and carried off: Nor do they require any other Preparation to their Separation, but what conſiſts in their Transmutation into thoſe Humours *in Specie*; which is done only by the gradual *Deſlagration* of the Blood, by which the vital Heat is ſuſtained. For hence it is, that in Tract of Time the nobler Parts of the vital Juice are diſſipated and conſumed, and the remaining Parts, which they had before kept united, divided into various Parties, and becoming excrementitious, paſs ſome into *Bile*, ſome into *Phlegm*, and more into the Matter of *Urine*; and all theſe now unprofitable Humours, being brought together with the Blood to the reſpective Organs in which they ought to be ſeparated, are there by way of Percolation ſecern'd, and by their proper excretory Veſſels carried off and eſected.

If this be admitted for true, What then are we to think of the long-lived and even to this Day flouriſhing Doctrine of the *Ancients*, that attributes *Tertian Fevers* to *Choler*, *Quotidian* to *Phlegm*, and *Quartan* to *Melancholy*?

I answer, (with Dr. *Gliffon*, who in all Arguments endeavour'd, as far as his Devotion to Truth would permit him, to ſuſtain the Authority of the *Ancients*) that thoſe Humours were, or at leaſt might be taken, either for the *Reliques* of the ſtale and vapid Blood, or for Humours *analogous* to them.

The *Reliques* of the Blood are (as was juſt now ſaid) reſolved into *Bile*, *Phlegm*, and *Urine*; in the laſt of which are contain'd four other Kinds of Excrements, *viz.* the *potulent Matter*, *Salt*, *Serum*, and a certain earthy *Liquamen*, commonly diſtinguiſh'd by the Name of *Tartar*. But as for *Melancholy*, no Place is to be found for it among the *Reliques* or ſtale and reſected Parts of the Blood: For in the whole Body we find no peculiar Organ provided by Nature for the

Secretion, Reception and Excluſion, of any ſuch Humour; and therefore, ſaving the Reſpect and Veneration due to thoſe Fathers of our Art, the Inter'eſt of Truth, which is ſtill more ſacred and venerable, obliges us to affirm, that they erred moſt egregiouſly, when they aſſigned that Office to the *Spleen*.

The Humours *analogous* to the newly enumerated *Reliques* of the Blood are ſignify'd by the ſame Names. In particular, the viſcid, inſipid and white, Part of the Blood is called *Piuita* or *Phlegm*; the hot, dry, acrimonious, and pungent or corroding, *Bilis* or *Choler*; the cold, dry, blackiſh and aduſt, *Melancholy*, if at leaſt any ſuch Humour may be admitted to lie conceal'd in the Maſs of Blood: For, we muſt confeſs, we uſurp more than a Phyſical Licence, when we call this an analogous Humour, to which nothing that holds any the leaſt Reſemblance or Analogy can be any where in the whole Body found: And yet nevertheless it may be lawful to ſay, that the Analogy that ſome Parts of the Blood ſeem to have to that fictitious Humour, which the *Ancients* imagined to be ſeparated and received by the *Spleen*, may ſerve to excuſe us, if (out of Compliance with Cuſtom and the vulgar Doctrine of the Schools) we retain the Denomination, while we rectify the Notion, of *Melancholy*. For though the *Analogatum* be wanting, yet if in reality a Thing reſpondent thereto hath Exiſtence in Nature, the ſuppos'd Analogy is enough to juſtify the Appellation.

Conſidering this, I aſſert, that in the Maſs of Blood are moſt commonly contained, 1. A ſharp, pungent or corroſive *Serum*, ſuch as is wont to be caſt out by Exſudation in an *Eryſipelas*, and in the little Bladders or Bliſters rais'd by *Epiſpaſtic Emplaſters*, which answers to the *Bile* or *Choler*; 2. A whitish and fibrous *Grumus*, that reſembles *Phlegm*; 3. A duſkiſh or blackiſh and friable *Grumus*, comparable to the *Melancholy* of the *Ancients*; for other Humour that may deſerve that Name, there is none to be diſcern'd in the Blood.

Now, that we may ſee how far theſe Elements or conſtituent Principles of the Blood can be brought to conſiſt with the Humours of the *Ancients*, let us equitably compare theſe with thoſe. According to their ſeveral

ral Characters or Descriptions, the pure and natural *Serum*, by which, mix'd with the *Lympha*, the Blood is made and kept fluid, seems to be the same with the natural and pure *bilious* Humour of the Ancients; and the same corrupted, and thereby grown acrimonious and corrosive, what they understood by *Choler*, analogous to the *Gall*.

2. The white and viscid *Grumus*, while uncorrupt and in a natural State, seems to agree with their natural *Phlegm*; when degenerate and corrupt, with that morbidick Humour which they called *Pituita analoga*.

3. The black and friable *Grumus*, when pure and sincere, is the *Humor sanguineus* specially so called, and that very Part of the Blood which, impregnate with vital Spirits and the nitrous Spirit of the Air, gives it a florid red Colour; but despoil'd of those Spirits, and receding from that scarlet toward a sooty or black, (whence probably it received the Name of *Melancholy*) is the *Melancholy* they imagined to be like the Humour of the Spleen. This *Parallelism* being granted, there seems to remain no Difficulty in reconciling the Doctrine of the Ancients concerning the Humours contain'd in the Blood, with the constituent Parts of it now observed by us; and by Consequence, nothing hinders but these *analogous Humours*, as we have distinguish'd and described them, may be the *material* Causes of putrid Fevers; yea farther, 'tis necessary that one or more of them be peccant in every putrid Fever; which is what we sought toward the establishing our present Genealogy of putrid Fevers, without demolishing what the Ancients have deliver'd of the same.

Let us then proceed to inquire into the Origine of *malignant* Fevers, which ought to be deduced from a certain Ferment of another Kind, not yet described. For malignant Fevers being by their Nature always more pernicious than simply putrid, and often also contagious; it must be therefore that they take their Original from some Ferment more malicious, and more grievously hostile to the vital Motion of the Blood. This Ferment then, whatsoever we shall at length discover it to be, may justly be named in the general *Fermentum malignum*, as coming near to the Nature of *Poison* proper-

ly so called, about the Reason of whose fierce and pernicious Operation upon the very Principles of Life Physicians are strangely divided in their Opinions. Omitting all which, I humbly conceive, that the deleterious or deadly Force of any Poison whatsoever doth consist, not in any manifest Quality, but in some *seminal* Nature highly adverse and destructive to the Mication of the Blood in Man, upon which his Life immediately depends. There are (I must confess) too many other Things, that with equal Speed and Cruelty break asunder the slender Ligaments of Life, even by their manifest Qualities, if once admitted into the Stomach; as Fire, Oil of Vitriol, strong Spirit of Salt, *Aqua fortis*, lixivial Causticks, Arsenick, Sublimate, &c. which, by reason of the extreme Subtilty and most rapid Motions of their Particles, and of their Force of penetrating, cutting, corroding and dissolving, almost all Bodies to which they are applied, are as mortal as a Sword or Bullet; but all these, if they be sufficiently *diluted*, lose their fatal Vertue, and become innoxious; nor can they be rightly reckon'd among *Venoms*, no more than a Dagger or Halter, because they destroy by manifest Qualities, and Ways evident to the Sense. But *Poison*, whose Power is founded in a *seminal Nature*, secretly repugnant and pernicious to humane Nature, whether it be bred in the Body, or introduced by Contagion or otherwise, is always more or less noxious in a small Quantity, and in a full Dose deadly; so that 'tis dangerous to trust to a Dilution of any such *Venom*. And to this Kind are the *malignant Ferments*, of which I am now speaking, to be referred; though some of them be more venomous than others, and some more contagious: For the *Malignity* of all seems to consist in a *seminal Nature*, which (being communicated to the Blood) is apt to impugn, retard, oppress, and (when it prevails) totally extinguish the expansive Motions of the vital Spirits that conserve it.

Having thus concisely explained the formal Reasons and distinct Proprieties of both Sorts of Febrile Ferments, the putrid and the malignant, that work immediately and *per se* by way of *Oppression* of the vital Spirits; 'tis opportune for us to inquire into the

the Nature of them, consider'd first *absolutely*, and then *respectively* to the Manner of their Operation upon the Blood in generating Fevers.

I advertise therefore, that when I speak of *Crude Chyle* brought into the Mass of Blood, and by degrees inducing Putrefaction or Fermentation upon it, as I have briefly shewn in the Paragraph concerning putrid Humours, rendering the Blood impure; I do not call such Chyle *Crude*, because I think it wholly unfit to afford some Nourishment to the solid Parts, though Impure and Imperfect; but because it is not sufficiently concocted and prepared, so as that being united with the Blood, it should be made the immediate Subject of the vital Spirits, or (which is the same thing) be impregnated with *Vitality*. Now, Chyle in this sense *Crude*, hath not yet attained to a degree of inquinament high enough to give it the Nature and Force of a *Febrile Ferment*; which strikes at the very Root of the vital Motion or Heat. For it consisteth in a certain *Aptitude* to Infringe, Diminish, Retard, Oppress, and (if not overcome and expell'd by the Spirits of the Blood) utterly extinguish the vital Mication of the Blood, whence Life Results. For, consensaneous it is both to Experience and to Reason, that this Aptitude is not acquired in a few Moments of Time after Crudities have been commix'd with the Blood; nor doth it actually attack the vital Spirits so soon as the Ferment is Diffused, but doth exert its Power slowly, by insensible Degrees, and as it were by creeping on, like an Enemy that designs to steal a Victory. First it gently, and by little and little insinuates it self into the Mass of Blood, and diffuses it self equally through all the Parts of it. Then it comes to be united with the Spirits that conserve the Blood, as if it were a natural Ingredient of the Mixture. That done, if either the quantity or contumacy of it be so great, as that the vital Spirits be unable to moderate and reduce it to Conformity, or to expel and dissipate it; it begins to operate, to weaken, and suppress them, affecting them with a kind of *Torpor*, and clogging them so as they cannot with requisite Vigour endeavour to expand them-

selves, and then the *Fever* first invades, as shall be more fully Explicated, when we come to examine the process of Fermentation in the Paroxysm of an intermittent Fever.

In the mean time it follows to be inquired, wherein this Aptitude of the *Fermentum Febrile* to fix the Spirits of the Blood, doth chiefly consist. I conceive with Dr. *Glisson*, that it is radicated in a certain *Lentor* or *Clamminess* of the Crudities mix'd with the Blood; Analogous perhaps to that Viscidity observed in Wine and Beer not perfectly fermented, which are therefore call'd, *Pendula*, or *Ropy*; nor can they be ever corrected unless by a new Fermentation, which exciting the oppressed and sluggish Spirits contained in the Liquor, and dissolving the Clamminess of the grosser Parts, quickly clarifies it. For, what can be imagined more apt to Clog, oppress and fix the Spirits of the Blood, so as to hinder their expansive Motion, than such a pendulous Clamminess of Crude Humours diffused through the whole Mass of it? I believe therefore, that the formal reason of every Febrile Ferment in putrid Fevers, doth consist in such a *Lentor* of the Blood. As for that kind of it, that arises from defect of Concoction in the Stomach, and that may therefore rightly enough be distinguished by the Name of *Crude Chyle*; it seems not at first to be affected with the pendulous Clamminess here described, but only with a certain Disposition or Tendency toward it, by reason the Spirits of the Chyle have not been sufficiently excited and exalted from the State of Fixation to that of moderate Fluxility, as they ought to have been: And yet this tendency may be sufficient by degrees to induce a Clamminess upon the whole Mass of Blood, when Crudities are daily increased and accumulated, as commonly they are before a putrid Fever is generated. Other kinds of it are almost all derived, either from Transpiration intercepted, or from Extravasation of Humours, as in internal Apoplexias, and in the Dropsie; or from Inflammations and Tumours, where the course of the Blood is stop'd. For part of the Blood is arrested, and for want of due Motion corrupted, being at length carried off by the

the Veins, and remix'd with the whole Mass thereof, must of necessity more or less pollute it.

But if we convert the Eyes of our Curiosity upon the *Effects* of this Febrile Ferment, and consider the manner and process of its acting upon the Blood; we shall soon find, that what hath been said of the *Narcotick* and *Fixative* Power of it, will be sufficiently consentaneous and evident to engage our Belief. For, from thence it will appear, by what reason and way the Ferment is wont to exert its Forces, and exercise its Tyranny upon the vital Spirits, in the divers times of a *Paroxysm* or fit of a Fever, *viz.* in the beginning or *invasion*, in the *augment* or increase, in the Vigour or *Achme*, and in the *Dedination*.

I say then, that before the actual Invasion of a Paroxysm, the Febrile Ferment is already diffused through the Blood, and united with the vital Spirits. Upon this, it of necessity comes to pass, that the Spirits being clogg'd, and as it were inviolated by the pendulous Clamminess thereof, remit somewhat of their Vigour and Endeavour to Expansion: And consequently with less briskness irritate the Ears and Ventricles of the Heart, and Arteries conjoyn'd to them, to contract themselves, in order to the Distribution of the Blood. Hence it comes, that the free Transpiration of the *halitus* or steams of the Blood is more or less Check'd, and render'd more slow and weak than it ought to be. And this makes the *first* insult or surprise of the cold Fit, which tho' scarcely perceptible in the beginning, comes creeping on more and more, till the Eclipse it brings upon the vital Spirits, be manifest from the weakness and languid Motion of the Pulse, and from the chiliness of the whole Body, and dead paleness of the Face, &c.

A little after, the Pulse is more retracted and languid, and the Eclipse increasing, the Nails of the Fingers become pale and of a leaden Blew, the extrem Parts grow sensibly Cold, and all the other Symptoms grow more Strong and Vexatious, so that the Patient is now compell'd to feel the Attack his Enemy is making upon the Guards of his Life. And this is the *second* step of the cold Fit.

Which ceases not yet, but is continued a good while after its first sensible Invasion;

the depression of the vital Spirits, the retraction of the Pulse, and the consequent Diminution of Heat, still by degrees increasing. Nevertheless, soon after the beginning, the irritation of the vital Spirits to rise up and oppose their intestine Enemy, and to repel it by their spontaneous Expansion, begins. For, first they strive to resist Oppression by the Clamminess of the Febrile Fermentation, and to shake off the Clogg, by their Natural Agility. Then the Mass of Blood, being slowly and heavily diffused into the Parts of the Body, doth in some degree stagnate in the Avenues of the Heart, and by its resistance burden the Heart and Arteries, and so incite them to make more frequent Pulses, to discharge it. Then the *Effluvis* of the Blood, being by intercepted Transpiration retained, and by the Veins returned to the Heart, serve somewhat to excite the Spirits, and to discuss a little of the Clammy Ferment repressing them. But yet these three irritations conjoyned, are not from the beginning of so great Moment, as quickly to hinder the increase of the Cold, or farther Depression of the vital Motion: Only they so far avail, as to hinder the influent Life from being wholly Eclipsed. And at this time it is, that the first certain Signs of actual Fermentation of the Blood, shew themselves Physicians accurately observing them. For, so soon as the certain Signs of an universal Oppression of the vital Spirits appear; we may from that time date the Commencement of the Fermentation immediately consequent thereunto: Because they declare that the Ferment hath already actually begun its Work.

These *Signs* and *Symptoms* then are (as I have said) *first*, Retraction of the Pulse, Chiliness, Paleness, and sometimes *Eleveness* of the extrem Parts, chiefly of the Nails, tip of the Nose and Lips, and some light *Constriction* of the whole Skin. Because at that time there happens some Oppression of the vital Heat, which governs the Pulse, renders all Parts actually Hot, gives a vivid and grateful Tincture of Red to all, and plumps up the Skin that otherwise would shrink it self up.

Secondly, A troublesome Sense of Cold, accompanied with a *Horror*, Trembling, Shivering, or *Shaking*. All from the difficult

Passage of the Blood through the Habit of the Parts. For the Blood being but weakly emitted from the Heart, and passing slowly through the Substance of the muscular Parts, hurts and offends them by Vellication or Attrition.

Thirdly, A weak and quivering *Voice*, and shortness of *Breath*, for the most part trembling and unequal: Which seems to arise, partly from a depression of the vital Heat, partly from Cold unequally affecting the Lungs, and hindering the free ingress and egress of the Air; and partly from the difficult Passage of the Blood, either through the Lungs themselves, or through the Muscles, helping to move them.

Fourthly, The *Moisture* of the Mouth and in the Glands circumjacent begins to be dried up, and thereupon ensue *Thirst* and *Dryness* of the Tongue; the Reason of which seems to be this, that the *Latex serosus* is in the febrile Fermentation so confounded with other Humours, that it cannot be separated from them in the Glandules destined to the Secretion of it. Other Effects or Signs of the Fermentation observable in this Beginning of the Paroxysm, I reserve till we come to the *Augment*, in which they become more conspicuous.

In the *Augment* therefore no new Motion arises, only the former are either by degrees less'n'd or increas'd. Those that belong to the simple *Depression* of the vital Spirits are gradually diminish'd; but those that are referrible to the *Incitation* or *Suscitation* of them are by little and little augmented. Of the former Sort are, *Chillness*, Sense of Cold, *Shivering*, *Trembling*, *Quaking*, all which by degrees cease and vanish; because upon the raising of the Pulse, the Blood is transmitted more briskly and speedily through the Habit of the Parts. The *Voice* also becomes more strong and uninterrupted, and the *Respiration* more frequent and equal, for the same Reason. On the *contrary*, the provoked vital Spirits now rising up against their intestine Enemy, cause a manifest Increase of the febrile Fermentation and Tumult; for the expansive Luctation grows more and more fierce and exorbitant, and recedes farther from the natural State, till it becomes turbulent; hostile, frothy and unequal. The *Consequents* of these irregular Motions are,

1. *Inquietude*, *Festigation*, and sometimes *Pain* of the outward Parts, but chiefly of the *Head*; all from the difficult Transmission of the Blood through them.
2. *Frequency* of the Pulse, and now and then *robust* Vibration of the Heart and Arteries; probably from the intercepted Course of the Blood, and the Augmentation of Heat.
3. *Diminution of Transpiration*, which, though now somewhat greater than from the Beginning, continues much less than it ought to be, considering the Abundance of *Effluvia* or Exhalations of the Blood raised by the intense Heat.
4. Greater *Consumption* of the *Latex* in all Parts of the Mouth, and consequently more grievous *Thirst*.
5. *Nauseousness*, and sometimes *Vomiting* or *Flux* of the Belly; for the Stomach and Guts are of all Parts most troubled and offended by the tumultuous Afflux of the Blood, as well because of their nervous Texture, and their exquisite Sense thence arising, as by reason of the Matters contain'd in their Cavity, which (the containing Parts being irritated) fluctuate, and so become more apt to be moved and ejected upward or downward: And for the same Causes the same Parts are often molested with *Winds* and *Eruptions*, all *pneumatick* Fermentations (in the Number of which our febrile Fermentation hath a Place) conducing much to the Generation of *Winds*. During this Time of the Paroxysm, the Fermentation and Heat, and all the Consequents of them here recounted, excepting perhaps the last, are augmented by degrees, till they arrive at the *Acme* or *State*. But so soon as the Transpiration comes to be more free, and answerable to the Abundance of Exhalations steaming from the Blood, so as they no longer recoil by the Veins to increase the Situation of the Blood, the *Augment* ends, and the *State* of the Fit succeeds.

In which the Fermentation and Ardor persist a while in their Violence and Fury: And though at this Time some Parts of the oppressing Ferment begin to be discus'd and expell'd by laborious Sweat, yet the vital Spirits are by that tumultuous Motion so profusely spent and exhausted, that Nature suffers almost as much of Loss by that Exhaustion, as she receives Relief from the Victory and Expulsion. Whence perhaps it comes,

comes, that yet the Conflict appears doubtful and equal, till the Beginning of the *Declination*, when the febrile Heat and all its Concomitants are by degrees mitigated.

And then it is, that the Victory of the vital Spirits being compleat, the remaining Parts of the febrile Ferment are, by an universal Sweat flowing without any considerable Detriment of the Strength of the Patient, dispers'd and exterminated: For this Sweat is a kind of Despumation of the Impurities of the Blood that caus'd the Paroxysm; whereupon soon ensue a Remission of the burning Heat, a Cessation of Anxiety and Pains, and a fresh Diffusion of the *Laxtex serosus* into the Throat and Mouth for the quenching of Thirst; and in fine, a Cessation of all other vexatious Symptoms of the late Conflict; and so at length the Paroxysm is ended. Now from this our congruous Solution of all the *Phænomena* of the Fit of a Fever, ye may easily judge of the Reasonableness of the precedent *Hypothesis*, according to which I have endeavoured to explicate them; and how far the same may deserve your Approbation or Dislike.

Nevertheless I am willing ye should suspend your Sentence, till I have carried on the *Hypothesis* farther; for there yet remain many other Appearances to be solv'd. I proceed therefore to the primary *Differences* of Fevers, in hope that they also may be commodiously deduced from the same Principles.

Forasmuch as it is probable from what hath been said of the Nature of a Fever in general, that all Fevers arise from and essentially consist in a Fermentation of the Blood; we may with Reason infer, that the Diversity of Fevers, how great soever it be, proceeds from nothing else but the divers Fermentations of the same Blood: For the Diversity of Effects is for the most part respondent to the Diversity of Efficients. And since it is scarce possible, but that from various Ferments, various Kinds of Fermentations should arise; it necessarily follows, that the various Sorts of Fevers are to be deduced from equally various Ferments actually hindering the vital Mication of the Blood. And I hold, that there are so many Differences of febrile Ferments, as there are di-

vers Natures or Dispositions of Crudities incident to the Blood, and apt to inquminate it. To know all these distinctly, and to explicate each of them by a particular Description, is perhaps impossible; so great is the Variety of crude Humours that may be admitted into the Blood, and so manifold the Combinations of them that may happen to pollute it. Let it suffice then, if reflecting upon the chief Sorts of *Crudities* already described, we shall from thence congruously derive the *primary*, i. e. the most frequently observed *Differences* of Fevers.

By *Crudity*, I here understand any Iniquinament or Depravation of the Blood whatsoever, proceeding from the Defect of due Preparation thereof, for the Generation of vital Spirits; as I before declared. Now the Matter in this Sense *crude*, may be distinguish'd into *ordinary* or familiar to humane Nature, such as arises from the erroneous Use of the six Non-naturals; and *extraordinary* or alien and hostile to humane Nature. From the *former* come all Fevers call'd *simply putrid*; from the *latter*, *malignant* and *contagious* or *venenous*.

The *ordinary* may be subdivided into, 1. *Recent* or lately generated, such as is either carried out of the Stomach and Guts in the Form of crude Chyle, or reduced from some Part or other inflamed or otherwise corrupted; and, 2. *Inveterate*, or in a long Tract of Time by little and little congealed, and adhering to the Substance of the solid Parts. The *former*, if it happens to pass into a febrile Ferment, produces a Fever putrid indeed, but of only *one* Paroxysm. The *latter* likewise generates a Fever putrid, either accompanying some other Malady, or symptomatick; but each of them, either *continual* of uncertain Exacerbation, or *intermittent* of uncertain Paroxysms.

The *extraordinary* or malignant, which includes some certain seminal Principle dangerous and hostile to humane Nature, is also *double*, viz. either it is disseminated by Contagion, or is primarily bred in the Body affected. The *former*, though resolved into an Exhalation and dispers'd through the Air, still retains its poisonous Virtue, as the *Miasma pestilentielle* or Infection of the Plague. The *other* is either not resolved into Exhalations, as *Arsenick*; or is, in the very

Resolution, despoil'd of its seminal Malignity, as the Breath of a *mad Dog*, which seldom or never infects alone, without the *Saliva* in Froth.

Having exhibited to your Consideration this plain and brief Scheme of the different material Causes, from which I suppose the principal Differences of Fevers to proceed, I must reflect upon the Heads thereof more particularly, and in the first Place resume the Explication of Crudity not malignant, as that which both more frequently occurs to our Observation, and is less obscure.

The Matter of *putrid Fevers not malignant* proceeds (as I lately insinuated) either, 1. From Defect of Concoction of the Chyle in the Stomach and Intestines; or, 2. From Defect of due Eventilation and free Motion of the Blood in its Circuit.

Defect of Concoction of the Chyle is a Thing so common, and so fully explain'd by Physicians in their practical Writings, that it is sufficient for me to name it. And indeed in all Fevers, the concoctive Faculty of the Stomach is wont so much to languish, that scarce any Thing of Aliment can be, without Detriment, taken into the Stomach, already troubled and inquinat with vicious and corrupt Humours; for then the Food is not digested, but whatever of either Juice or Tincture is drawn from it remains crude, and turns to the Augment of the Matter of the Fever: Whence it comes, that Fasting and a thin Diet are to much commended by all in putrid Fevers. Only in pestilential, a Diet less spare is sometimes allow'd with good Success; because the Benignity and sweet Spirits of the Aliment are found to temperate the *Seminum pestiferum*, and reduce it to a milder Disposition. Not of these Fevers therefore, but only of those, are we to understand the Counsel given by Hippocrates, Aphorism. n. lib. 2. *Corpora impura, quo plus Alimentum assument, eo pluribus Damnis augentur*; & (Aphorism. 7. lib. 1.) *Si Morbus sit peracutus, tenuissima Diata est utendum*.

Defect of due Transpiration or Eventilation, and of free Circuition of the Blood, is sometimes the Cause, sometimes the Effect of Fermentation therein. The Cause, if no other Vice, before disposing the Blood to Putrefaction, hath given fit Matter for the Generation of a Fever; for Want of free Transpiration,

and Interception of the Course of the Blood in any Part of the Body, are alone sufficient to infer Putrefaction upon the Blood; but then the Fever is for the most part easily dissolv'd, and with one universal Sweat wholly solv'd. It miseth commonly from the diminish'd Perspirability and Permeability, either of the whole Body, or of some private Part, whose inconspicuous Pores are constricted or obstructed; and this happens either with or without Extravasion of Blood. With Extravasion, comes a *Tumour*, if not an *Apothem*, which most commonly produces a Fever of uncertain Exacerbation; as is frequently observ'd in great Obstructions and Abscesses of the Lungs.

Having concisely recounted the procatartick or antecedent Causes of crude Matter apt to induce putrid Fevers, I must come to explain what I said of the *Aptitude* of crude Chyle received into the Blood to corrupt it *Miasmate febrili*. That I may do this with Pertinuity and Coherence, two Things occur here to be consider'd: One is, when that suppos'd Aptitude or Disposition of Chyle imperfectly concocted comes to be matured or exalted to an actual Fermentation of the Blood: The other, where that crude Chyle is wont to lurk or lie conceal'd, until attaining to Ripeness, it hath acquired Forces sufficient to induce Fermentation upon the Blood.

To the former of these two Questions therefore I answer, that crude Chyle, though from its first Admission into the Blood it continually tends toward a febrile Ferment, doth yet notwithstanding rarely attain to that last Degree of Depravity, where it meets not with an *Apparatus* of like Matter before congeited in the Body, sufficient to augment its Forces, and serve for convenient Fuel to a Fever: For it is by long Experience found, that very few fall into any simply putrid Fever, unless after many Errors admitted in the Use of the six Non-naturals: Nor is the febrile Ferment it self wont, so soon as it is existent in the Body, to kindle a Fever by breaking out into Acts of open Hostility upon the sudden, but by secretly creeping on as it were, and passing through certain Degrees of Operation successively. First, it is insensibly diffused through and intimately commix'd with the whole

whole Mass of the Blood, after the manner of other Ferments. Then inwrapping the vital Spirits by little and little with its Clamminess, it diminishes their Agility, and disposes them to Sloth. After this, it endeavours to inviscate, bind, and as it were suffocate them; and then it is, that from their expansive Reluctation, the Conflict and Fermentation Commences. All which may be collected from intermittent Fevers, at least, if it be true (what many eminent Physicians hold) that the whole Febrile Matter that causes a Paroxysm, is as it were burn'd out and consumed in that Paroxysm: As in an intermittent Tertian, there intervenes a whole day of Vacancy from a Fever, and of quiet betwixt every two Paroxysms; during which Interval, the Febrile Ferment is only dispositive, and preparing to unite it self intimately with the vital Spirits. But in a simple Quartan, two whole days intervene betwixt the precedent Paroxysm, and the crude Matter doth not presently produce a Fermentation, but by degrees, and by way of Disposition. Which may be sufficient to solve the *first Question*, viz. When the Crudities commix'd with the Blood come to acquire the degree of Exaltation requisite to induce an actual Fermentation upon the Blood.

As for the *other*, viz. Where the same crude Matter is wont to be congested, and to lye in ambush till that time; if the whole matter of the precedent Paroxysm, be spent and consumed in the Paroxysm, as hath been supposed: Then, it necessarily follows, that the Matter of the subsequent Paroxysm, must either be generated anew, in the time intervenient betwixt the two Fits, or lie conceal'd somewhere in the Body, either in the Vessels carrying the Blood, or out of them; from whence, as from its *Fomes*, it may after certain Intervals of Time, sally forth to infect the Blood, and invade the vital Spirits. For both these, cannot be true; and therefore it remains to be inquired, which of the two is most likely to be so. My Opinion is, that the Matter of every subsequent Paroxysm is not generated anew; and my *Reasons* are these.

(1.) So soon as any Paroxysm is ended, the very Essence of the Fever Ceases for that time, and the Blood quickly returns to an

Apyrexia. Now if the Cause be extirpated together with the Disease, nothing will be left remaining in the Body to continue it: And by consequence, every new Paroxysm will be a new Fever; which no experienced Physician, who hath observed the Disease to be of the same Genius or Nature from the first Fit to the last, will easily be brought to grant. (2.) The same may be confirmed by this, that intermittent Fevers, even in poor Country People, frequently run thro' all their times regularly, by degrees ascending to their State, and thenceforth gradually tending to their Declination, when no Physician is called to succour Nature: So that merely from diligent Observation of the Motion of the Fever, a certain Prognostication of the State and final Cessation of it, may be collected, which would be impossible, if the Matter of the Disease were every day generated *de novo*: For who could foresee, when that new Generation would cease?

(3.) The Cause of the Fever coming *ab extra*, is accidental, and depends on a less or greater Error committed in Diet, and is constituted *extra Febris essentiam*; nor can any indication be from thence desumed. And our Dr. *Glisson* affirms, that he knew a Man, who being of a strong Constitution, and afflicted with a *Tertian Intermittent*, obstinately abstained from all Meat and Drink, from one Fit to another; and yet could not thereby elude the return of his Fever. It may be therefore with good reason inferred, that putrid Fevers have an internal *Focus* somewhere in the Body, whence the material Cause of them breaking forth, and gathering fresh Forces, invades and irritates the vital Spirits again and again, even till the *Fomes* be utterly Exhausted and Consumed.

There are (I confess) many great Wits, who in every intermittent Fever, seek for a *peculiar Fomes* or Seat of the Cause. I confess also, that sometimes such a particular and partial *Fomes* may be found: As for Instance, in the Stomach, or in the *Pancreas*, or in the Mesentery, and other Parts of the *Abdomen*. And an Inflammation of the Lungs is in some sort the *Fomes* of a *Peripneumonia*; an Inflammation of the *Pleura*, the *Fomes* of a *Pleurisy*; and *sic de multis aliis Partibus*: So that it cannot be denied, but

but both intermittent and continual Fevers may arise from particular Seats, and that an Apostem, chiefly an *Empyema*, may minister Fuel to a Fever; yea more, that an Inflammation repercus'd from the outward Parts, and a Gangrene in any the remotest Member of the Body, may produce a continual Fever, by sending forth corrupt Matter to pollute and infect the Blood. All this (I say) must be confessed. And yet nevertheless it must be acknowledged, that besides these particular *Fomites* of Fevers, there is a certain *General one*, common to all putrid Fevers: And this general *Fomes* I hold to be the very *Parenchyma* of the Parts nourished out of impure Juices.

For this *Fomes* is of all others hitherto supposed, most consistent with the Circulation of the Blood, by which it is commodiously carried to all Parts; and diffused universally: Whereas other impurities can scarcely be so accumulated in the solid Parts, but they must, when extravasated, obstruct the free course of the Blood. If they be supposed to stick, and be congested in the capillary Vessels, or in the inconspicuous Pores of the Parts; they must be a manifest and intollerable Obstacle to the Pertransmission of the Blood. If out of the Vessels, they stagnate in the Habit of the Parts, they must induce, not a Fever, but a *Cachexia*, or an *Anasarca*. Compelled therefore we are to fly to the very *Parenchyma* of the Parts; which in every putrid Fever are necessarily fused or melted by degrees, and being, as necessarily become Fewel to continue the Fever. For, in *continual* Fevers, the substance of the Parts amass'd out of Crude and impure Chyle, is *continually* melted, and so maintains the Fermentation without Intermision, until all the Fewel be consumed, and then the Fever is extinguished. But in *intermittent*, the same impurities are melted by turns, or *Intervals*; and in every Paroxysm, some Portion of 'em is colligated into a kind of *Sanies*, or putrid Matter; which being remix'd with the Blood, becomes, in a *Tertian*, the Fewel of a Paroxysm to recur on the *Third Day* from its Fusion; in a *Quartan*, of a Paroxysm to invade on the *Fourth*; in a *Quotidian*, of a Fit to return on the *next Day*; & sic de ceteris.

And as to the *Duplication* and *Triplication* of these intermittent Fevers: 'Tis probable, that when of a *Simple Tertian*, is made a *double one*, the Simple is not the direct Cause of the double: But the latter arises from Causes like to those, from which the former took its beginning: So that a double Tertian may be rightly enough accounted to be *two single Tertians* alternately succeeding and complicated with each other. And the same, *mutatis mutandis*, may be said, with equal Congruity, also of the origin of a double and treble *Quartan*. *

But there remains yet another *Difficulty* greater than either of the two precedent; viz. concerning the *Suspension* of the Action of the crude Matter, to the time of the Paroxysm, in which it is actuated. That the State of which *Question* may be the better understood, let us (for instance Sake) suppose, that in a double Tertian, *A. B. C. D.* are four distinct crude Matters, melted and set afloat in the Mass of Blood in four successive Paroxysms. Let us suppose also, that this Fever first invaded the Patient upon *Monday*, and that in the first Fit, it melted so much of the crude *Parenchyma* of the solid Parts, as may suffice to produce a new Fit on *Wednesday* following. Let us suppose farther, that on *Tuesday* another Tertian began, and during that first Fit in like manner melted so much of the crude *Parenchyma*, as may be sufficient to raise a second Fit on *Thursday* following. These things being supposed, the Question is, why the crude Matter *B.* melted on *Tuesday*, is not dissipated or corrected on the *Wednesday* following, when the crude Matter *A.* causing a Fit, is by the Fermentation rarefied, and expelled by Sweat: Why, I say, the Matter *B.* being remix'd with the Blood all *Wednesday*, when the Matter *A.* was Fermented, is not by that Fermentation corrected and dissipated at the same time; but suffered to lye dormant, and cause a Fit on *Thursday* following.

To untie this Knot therefore, I say, that the Febrile Fermentation doth not much alter any crude Matter, that doth not yet *actually* impede the vital Motion of the Blood. For, the Fermentation is regulated by the vital Spirits, which in the case proposed, chiefly oppose and dissipate the

Matter *A.* which alone by its Clamminess actually hinders their expansive Motion. Hence it is, that in the Fermentation happening on *Wednesday*, the vital Spirits are not much offended with the new Matter *B.* then melted and floating in the Blood, because it is not actually Febrile, nor doth it oppress them, so as to incite them to vindicate their Liberty by their expansive Motion. And thus the difficulty seems to be solved.

What hath been said a little before, of the general *Fomes* of the putrid Fevers, as well continual, as intermittent, *viz.* that it is in the very *Parenchyma* or Substance of the solid Parts, amassed out of crude or impure Chyle; may perhaps to some of my Auditors, long accustomed to the vulgar Doctrine of Physicians, concerning the Genealogy of Fevers, seem to be only Precarious, and as easily denied, as affirmed: Because it still remains doubtful, *how Chyle crude or impure can be, instead of good and laudable Succus Nutritius, or Aliment, converted into the Substance of the solid Parts.* To obviate this their doubting therefore before it settle into a prejudice more difficult to be removed, it concerns me to assert, that there is many times an imperfect Nutrition, or Vegetation and Augmentation, as well as a perfect, observ'd in the Bodies of Men; and consequently, that the *Succus Nutritius*, or proxime Aliment of all Parts, is either *pure*, i. e. perfectly Concocted; or *impure*, i. e. imperfectly Concocted. Whence it comes, that the Bodies of some Men are even vulgarly said to be more or less *pure* than those of others.

Those few, who are so happy as to have Bodies in all Parts *pure* and clean from crude and vitious Humours, do not only from the right use of the six Non-naturals, enjoy perfect Health; but have this farther Advantage, that their solid Parts not being augmented by the accretion of crude Matter, they carry in them neither any *Febrile Fomes* congested in the Habit of their solid Parts, nor the least Disposition to any other Disease. When on the contrary, *impure* Bodies, either through intemperance, or too full Diet, Surfeits, Compotations, and other Debauches and Disorders; or from want of Exercise, to correct and dissipate the Crudities they have congested; are cram'd

and plump'd up with impure Nourishment, and perhaps also augmented to an unprofitable and unwieldy Bulk. These then must of necessity abound with a great stock of crude Matter, accumulated chiefly in the Substance of their solid Parts. Which when a Fever comes, from what cause soever, are melted by Degrees, and daily afford new Matter, to serve as prepared Fuel to the long and dangerous Fever, whether continual, or intermittent. But Bodies clean and pure, though perhaps liable to be surpris'd with a light feverish Distemper; are in much less Danger from thence: Because their solid Parts have not been imperfectly recruited with impure Nourishment; and consequently the *Liquamen* of them is not so *Crude*, as to suffice to renew often, or long continue the *Fermentation*. From the Testimony of our very Senses it is evident, that in all putrid Fevers, the Parts of the Body are more or less extenuated and colliquated: And that the crude *Liquamina* of them are the material Causes of new Exacerbations in continual Fevers, and of new Paroxysms in intermittent, is highly consensaneous to reason. Hence it is, that Men recovering from long Fevers, if they manage their Health circumspectly and with Temperance, attain to a Renovation as it were of their Youth: Because all the Substance of their Parts, that was amass'd out of Crude and impure Matter, being by the Fever consumed, their Bodies are now repaired with pure and convenient Juices, such as abound with sweet Spirits duly exalted and excited by Concoction in the Stomach. Hence also we are led to a clear understanding of the true Reason of that *Aphorism* commended to our Observation by *Hippocrates*: *Si fabricitanti, nec omnino leviter, suo in statu maneat corpus, nihilq; concedat morbo; aut hoc etiam plus aequo gracilescat, calamitosum: Hoc enim agri infirmitatem significat, illud vero diuturnitatem morbi.* For, the prognostick holds certain, *ratione tum cause, tum signi.* If the Habit of the Body be not extenuated in proportion to the Violence or Duration of the Fever, the cause must lye either in the abundance, or in the Contumacy, that is the great Viscidity or Clamminess of the crude Matter congested and affix'd to the *Parenchyma* of the Parts: And there-

therefore an observing Physician may from thence safely Predict, that the Fever will prove of long continuance at best, if not fatal in the End. On the other side, if the extenuation be too great, it must come from the great Force of the Heat or Fermentation in the Blood, that dissipates all things, not only the crude Matter pre-existent in the Habit of the Parts, but even the vital Spirits themselves, and the insite Spirits, that being intimately united with the Vital, should reinvigorate the Parts with Life, and conserve them. And therefore such impetuous Extenuation, is likewise both cause and sign of extrem Calamity. *Exhaustis enim supra modum & spiritibus, & partibus Solidis, omnis ratio pepasmi desideratur.*

All these Reasons duly consider'd, it must be granted that Bodies cannot possibly continue in all points pure and clean, if they be nourish'd with impure or crude Juices. Sound, indeed, and Healthy, they may be said to be at present, because they seem to foster no proxime Cause of Sicknesh discernable by a Physician: And yet nevertheless, since they carry about Crudities secretly congested in the very Substance of the solid Parts, which by occasion of any light feverish Distemper, that would not otherwise last above a Day or Two, may be melted and remix'd with the Blood, and long protract that Distemper: We are obliged to acknowledge, that such Bodies are really foul or impure, and contain in them a *Disposition* to a Fever more or less Remote. Otherwise it will follow that all Bodies actually Sound, are in respect of the Habit of their Parts, either equally disposed, or equally indisposed to Fevers, and to the continuation of them: Than which nothing certainly can be more False. For, have we not observed frequently, that Fevers, as well continual as intermittent, have in the beginning appear'd Mild and Gentle, so long as they were fomented only by Matter contained in the Veins and Arteries: and yet afterward, when they began to be supplied with new Matter of Fewel from the colligated Crudities that had been long congested in the Habit of the Body, they have rag'd in Extremity, and continued long before Nature, however accurately assisted and

succour'd by our Art, could bring them to a *Crisis*? Conclude we therefore, that in putrid Fevers, there is no other *Fom.*, but the described Crudities, by long Intemperance and other Errors in Diet, congested in the Habit of the solid Parts. For, these are in all putrid Fevers daily resolved or fused into a certain *Sanies* or corrupt Matter, and constitute a new *Febrile Ferment*: Which is the thing we have gone so far about to find.

But yet I must not omit to subjoyn, that these *Liquamina* of the solid Parts imperfectly nourish'd, are not confined within the narrow compass of one single *Genus*, but diffused through a large Field of indefinite *variety*. For, as indulgent Nature hath granted to us various kinds of *Aliments*, each of which is in its peculiar Qualities or Proprieties in some sort distinct from all the rest; and as the *Juices* or *Tinctures* extracted from them by the concoctive Faculty of the Stomach, are in diversity respondent to the diversity of our Meats and Drinks: So must it be granted, that the *Crudities* after imperfect Digestion admitted, first into the Blood, and then into the Habit of the Body, and there affix'd to the solid Parts, and at length resolved into a certain kind of *Sanies*, that is most apt to afford Fewel to putrid Fevers (as hath been often affirm'd) cannot be all of a Sort, but some different from others, respectively to the different Matters of which they were generated. And of these doubtless the variety is greater than can possibly be known by any Physician however curious; so far are we from hope to reduce them all to Computation. It were hard then for me, if any here present should exact from me an account of more of these obscure Differences, than what my present institute requires me briefly to explain: And all my learned Hearers will (I presume) be contented, if I do my devoir to reduce them in general to the *Analogous Humours* of the Antients above described, namely, *Choler*, *Phlegm*, and *Melancholy*; not pure or natural, but *Corrupt*. For, from these *Humours* taken in the Sense afore explicated, may be commodiously and congruously deduced, both the principal *Differences* of putrid Fevers; and the most probable *Causes* of those Differences.

First therefore, I must put you in remembrance of what I have more than once asserted, *viz.* That the Humours by this Hypothesis assigned to putrid Fevers for their Causes both Antecedent and Conjunct, are such which are not *exolete* or stale and despoiled of their Spirits, and grown vapid; but sufficiently *stored with Spirits*, noxious and insect to the vital Mication of the Blood.

Then I with good reason suppose, that when the *Crudities* received first into the Mass of Blood, and after into the substance of the Parts, come near to the Nature of the *Serum* of the Blood, now corrupt, and by that putrefaction render'd acrimonious and well nigh Corrosive (which emulating the Bile contained in the Bladder of Gall, makes the *Choler* of the Antients) there is congested and prepared Matter most apt and disposed to produce *Bilious* Fevers, as they are call'd *Tertians*, either continual or intermittent.

That in case the congested Crudities nearly resemble the white and viscid *Grumus* of the Blood (which makes the Analogous *Phlegm* of the Antients) but corrupt: Then there is laid up Fewel most convenient to form *Pituitous* Fevers, *Quotidians* continual or intermittent.

That if it happens, that the Crudities congested be of such a Nature and Condition, as to be affine to the Analogous *Melancholy* of the Antients, *i. e.* to the blackish *Grumus* of the Blood, degenerate from its natural Purity, and corrupt: Then the Bodies carrying them about are obnoxious and prone to a *Quartan* e'er long to invade them. And this may suffice to explain the Sentiments suggested to me by *Dr. Glisson's* New Doctrine, concerning the most general and obvious Differences of Crudities apt to produce Fevers, so far forth as they may be taken for the *Conjunct* Causes of putrid Fevers.

I come then to the Fundament of the so often mentioned division of putrid Fevers into *Continual* and *Intermittent*; that we may opportunely investigate, what that is, on which this remarkable difference seems immediately to depend. This in probability is nothing else but the very *Fermentation* of the Blood, in which alone the formal Reason

of all Fevers doth consist; and which by vehemently exagitating the whole Mass of the Blood, sometimes *continually*, sometimes by *Intervals*, and those one while *certain* and *ordinate*, another while *uncertain* and *inordinate*; induces that intense and afflicting *Heat*, in which alone the Antients have unanimously placed the Essence of a Fever; and renders the Pulses of the Heart and Arteries *more frequent* than they ought to be; so that from thence alone, as from a Pathognomonic Sign, a Physician may certainly conclude of the presence of a *Fever*.

A continual Fever therefore is that which from the first Moment of its Invasion, to the last of its duration, continues and afflicts without Intermision, never coming in all that time to a perfect *Apyrexia* or utter Extinction. This Fever, if it be mild, gentle, unaccompanied with grievous Accidents or Symptoms, and but of one days continuance; is thence call'd an *Ephemera* or *Diaria*: If in like manner mild, but of two, three, or four Days Duration, it is denominated accordingly a *Diaria* of a few Days, or more properly, *Synochus Simplex*.

An *Intermittent* Fever is that, in which the Febrile Fermentation doth not dure from the beginning to the end continually, but is *intermitted*, and returns with diverse *Paroxysms* after Intervals, now *shorter*, now, *longer*: And these *Paroxysms* running thro' their peculiar Times; namely their beginning, Augment, State, and Declination, there Alternately, *i. e.* after the end of every single *Paroxysm*, succeeds an *Apyrexia*, not perfect perhaps, but *quoad Sensum*. From this vicissitude, or rather from the various Intercalation of the *Paroxysms*, various sorts of intermittent Fevers have, for distinction sake, obtain'd various *Names*. In particular, when a new Fit, in proportion respondent to the former, returns daily, *i. e.* once in every twenty four Hours, the Fever is named an intermitting *Quotidian*. When a *Paroxysm* recurs every other Day, or on every third Day, 'tis called a *Tertian*, and by the Vulgar, a *third days Ague*. When the *Paroxysm* recurs not till after two whole Days of intermission, 'tis call'd a *Quartan*, or *fourth days Ague*: And forward; for there have been observ'd also *Quintans* and *Sextians*, though very rarely. Here give me

leave *en passant* to note, that the word *Ague*, by which the common People understand an intermittent Fever, is derived from the French Adjective, *Aigu*, which signifies *Acute* or *Sharp*: Perhaps because an intermittent Fever is *Acute* during the Paroxysm at least, and afflicts the Patient with *sharp* Pains; though by Physicians, respecting rather the Duration, than the vehemency of this Disease, it is number'd, not among *Acute*, but among *Chronick* Fevers. How properly therefore the *English* call an intermittent Fever, an *Ague*, I leave you to judge, while I return into my way.

There is yet another *Species* of Fevers referrible neither to continual, nor to intermittent, but *compounded* of both kinds; which though it continually augment the natural Heat of the Blood, nor ever comes to an absolute *Apyrexia*, no not so much as *Quoad sensum*, before it be wholly judged or ended; and in that respect may pretend to a place among *continual* Fevers: Yet hath certain *Exacerbations* and *Remissions* of burning by Intervals, and those sometimes only every Day, sometimes every Third, sometimes only every Fourth; and in that respect seems to belong to *intermittent*. Hence it is, that such a Fever is call'd a *continual Quotidian*, or a *continual Tertian*, or a *continual Quartan*, according to the time of its *Exacerbation*, or grieving anew.

Besides these three kinds of simple Fevers, Physicians have in all former Ages believed, that there are others, *compounded* of two or more intermittent. Of this sort are supposed to be.

(1) *Double*, or *Triple Quotidians*; when on one and the same Day, two, or three Paroxysms invade, in proportion respondent each to other successively.

(2.) *Tertians double*, or *triple*; believ'd hitherto to consist of two, or three *Tertians*, whether in a double, two Paroxysms return in one Day, or single Paroxysms recur every third Day: Or whether in a *Triple*, two Fits come in one Day, and a third on the next Day after; or three in one Day, and none the next Day. An intermittent Fever of this sort is distinguished from a *simple Quotidian*, by the time of its Invasion, by the time of its Duration, and by the Symptoms that are wont to accompany it.

For, in all these Circumstances, the *first* Paroxysm answers to the *third*, and the *third* to the *fifth*; but the *second* is respondent to the *fourth*, and the *fourth* to the *sixth*, and so forward. Whosoever therefore we shall observe this Analogy betwixt the Paroxysms alternately invading, we may with confidence pronounce, that the Fever is of that sort, which Physicians call a *double Tertian*. When we observe on the other side, that the first Fit is in all things like the second, the second like to the third, and so forward through the whole course of the Fever; we may certainly judge, that the Patient labours under a *simple Quotidian*. Besides these Characters of Distinction, Physicians have recorded one more, and 'tis this: If a simple Tertian hath preceded; recurring every third Day, and after return every Day; we may be sure, the Fever is of that kind, which heretofore hath been taken for, not a *simple Quotidian*, but a *double Tertian*.

Here perhaps ye will interrogate me about a *Simple Quotidian*, so frequently mentioned by me; namely, *Whether there be any such thing in Nature, or not?* And ye have reason, there being a kind of Civil War among the Sons of *Æsculapius* upon the Question. For, some of the Princes among them have with great eagerness contended to blot out of the Catalogue of Diseases, the very name of a *Quotidian*, as if really there were no such intermittent Fevers: And others no less renowned, as fervently, but somewhat more modestly, maintain, that of Six Hundred Sick Men that suffer new Paroxysms every Day, scarce one is afflicted with a *Quotidian*. I answer therefore, that true it is indeed, that a *Quotidian* hath been by some Authors, of great Fame, banished into the darksome Island of *Chimaras*; but unjustly, and by those who being carried away by Prejudice, and the Authority of their Predecessors, rather than conducted by the light either of certain Experience, or of right Reason, have by their Prevarication entangled their Followers in a gross and dangerous Error: As I hope to evince, when I shall come to explain the Causes of intermittent Fevers in particular; if what hath been delivered just now of the distinct signs of a *Quotidian*, be not thought sufficient to end the Dispute. For now I must hasten to the

third

third sort of supposed compound Intermit-
tents, viz. (3.) *Quartans, Double, or Tri-
ple*. For as often as it happens, that a Sick
Man, remaining free from a Fit only one
Day, is afflicted with two new Fits on the
two days next following: So often it is con-
cluded, that he hath a *double Quartan*. And
when a new Fit recurs every Day; but so,
that the first Fit answer to the fourth, the
fourth to the seventh; the second to the
fifth, and the fifth to the eighth; in fine,
the third to the sixth, and the sixth to the
ninth, and so forward: They conclude,
that of a simple *Quartan* produced, first is
made a *Double*; and then of a *Double*, a *triple*
Quartan. And this seems to be confirmed (as
Sylvius rightly observes) sometimes from the
reason of *curing* such Fevers, viz. if one Fit
be first taken away, and then on the two
consequent Days the Fits yet return, one day
of intermission interposed; or if two Fits be
taken away, one only remaining, and re-
turning every fourth Day: But more fre-
quently from the Symptoms, namely, the
shivering, quaking, long-lasting cold, &c.
which being more proper to *Quartans*, sel-
dom occur in *Tertians*, and never but where
the *Tertians* decline toward the Nature and
type of *Quartans*.

Besides all these sorts of intermittent pe-
riodical Fevers, there have been observed o-
thers; intermittent also, but of uncertain
Periods; which they have therefore named
Inordinate and *Wandering* or *Erratic*.

Having thus briefly run through all the
most remarkable Differences of putrid Fe-
vers, Simple and Malignant, Continual and
Intermittent, Ordinate and Inordinate, sin-
gle and double or triple; and deduced the
Causes of those Differences from Diversity
of Febrile Ferments operating upon the
Blood, either without or with intermission,
by certain or uncertain Intervals: pursuing
the *Glissonian Hypothesis* I design'd to as-
sert and explain; it remains, that to prevent
misunderstanding of what hath been said
of the *Duplication* and *Triplication* of inter-
mittent Fevers, according to the vulgar Do-
ctrine of Physicians, as if I adhered there-
unto; I repeat what was before said of that
nice Point: namely, that when a double or
triple Intermittent follows upon the Heels
of a Single, the single is not (as hath been

heretofore believed and taught) the direct
cause of the double or triple: But the dou-
ble or triple arises from the Causes of its
own, like to those whence the single at first
arose. So that every double or triple inter-
mittent ought to be accounted for two or
three single or simple intermittents of the
same Species, alternately complicate among
themselves.

Corollarium Therapeuticum.

MY *Pathalogick* Disquisition being now
at length ended, before all the Sands
in my Hour-glass are fall'n down; I can-
not (as I think) employ the short remain-
der of my time more profitably, than if I
subjoyn a brief *Therapeutick Corollary*, perti-
nent to my precedent Discourse, and use-
ful to younger Students in Medicine; for
whose instruction chiefly it was, that the
wise and prudent Authors of the Statutes
of this our so worthily renowned College
first instituted and ordained *Anatomick Lec-
tures* to be therein read by the learned Fel-
lows thereof, whensoever it should seem fit
to the venerable President.

I will therefore do my devoir to explicate,
wherein chiefly consists that *Pepasmus* or
Concoction of crude Humours, which Nature,
and her great Minister, *Hippocrates*, require
to their opportune Evacuation in putrid Fe-
vers; and by what kinds of Remedies the
same may be best assisted and advanced. For,
these things being well understood, will
afford much of Light toward the direction
of the younger Sons of Art, in the true
and most rational Method of *curing* Fevers;
in which no error can be little, no caution
too great.

I begin from that never to be forgotten
precept of the Divine Old Man, afore re-
cited: *Concocta medicamento purgare oportet,
ac movere; non cruda; neq; ineunte morbo,
nisi materia turgeat*. To which *Seneca* seems
to have had respect, when he said, in mor-
bis nihil est magis periculosum, quam immatura
medicina: And *Livy*, when he affirmed,
*Medicos plus interdum quiete, quam movendo
& agendo proficere*.

The *Concoction* or Digestion here meant, is
by *Hippocrates* expressed sometimes by the
word *πύρωσις*, sometimes by *πύρωσις*, to

contradistinguish it from *πείσις*, which properly signifies the Digestion of Aliment; as I have before Advertised: And according to the general Notion of all learned Physicians, Antient and Modern, it is, *eorum quæ sunt in corpore præter naturam, ad moderatam & secuturæ expulsiōni percommodam temperiem deducit*. In which Sense *Duretus*, the most faithful interpreter of the Oracle of *Corus*, expounds that place (*Lib. 1. Epidem. Anstii Foesii edit. Pag. 365*) *eorum quæ exeunt, concoctiones spectandas esse*. Upon which *Galen* copiously commenting, gives this memorable definition of the thing: *Nempe coctio est quædam eorum quæ sunt præter naturam, morbi maturatio*. And most rightly. For the Word *πείσις*, was properly used by the *Grecians* to express the Ripeness of the Fruits of Trees, by which they are advanced from the State of Crudeness or Immaturity, to that of Maturity or Perfection; and *metaphorically*, to signify that of the matter of Diseases, which Nature by degrees induces, in order to the seasonable and beneficial Expulsion of it, when she attempts a *Crisis* by ways most convenient.

Not that this Maturation is *always* to be expected in acute Diseases. For we are to remember, there are two sorts of *Crudities* of Causes apt to induce Fevers: One capable of being brought to moderation and ripeness; as that of the Blood in a *Phlegmon*, of the Phlegm in a *Quotidian*, of Choler in a *Tertian*, &c. Another, incapable of Correction and Mitigation; as the Febrile Ferment that causes *Malignant* and *Pestilential* Fevers, which being by its seminal Nature and unalterable Form, pernicious to the very principle of Life in Man, is sometimes by the force of Nature expelled and utterly exterminated out of the Body, but never can be so changed and brought into subjection, as to be made less Hostile to the vital Spirits that conserve the Blood. And therefore in such Fevers, wise Physicians are not wont to stay expecting Maturation of the Poyson mix'd with and fermenting the Blood, in the mean time losing the Opportunities of relieving Nature by proper *Alexiterial* and *Sudorifick* Remedies.

To come then to the Marrow of the *Question* propos'd. Considering: (1.) That the Crudity of Humours inducing Fevers im-

ply putrid, consisteth only in this, that the Spirits lodged in them are sufficiently Educated, Excited, and Prepared, so as to be fit to promote the vital Mication of the Blood; (2.) that all Fevers are essentially founded in the Fermentation of the Blood; and (3.) That the vital Motion or Heat of the Blood is always more or less impeded and perturbed, and often utterly extinguish'd by that Fermentation: Considering these things, I say, 'tis not difficult thence to infer, that the *Pepsimus* or *Concoction* requisite in all Fevers simply Putrid, i. e. *not Malignant*, must consist chiefly in three things *è diametro* opposite to those now mentioned; namely (1.) In the *Dissipation* and *Consumption* of the *crude Spirits* mix'd with the Blood; (2.) In the *Moderation* of the *Fermentation* begun; and (3.) in the *Conservation* and *Corroboration* of the *vital Powers*. And these certainly are the three principal Scopes to which a Physician ought to direct his Counsels, in the cure of putrid Fevers; and which for their great Importance, require to be singly explain'd.

To the *first* of these principal Scopes, *viz.* the *Dissipation* and *absorption* of the *crude Spirits*, and requisite eventilation of the Blood by them iniquated, we may most commodiously attain, by Fasting, at least by a thin Diet; by Remedies extenuating, acid, predatory and conducing to leanness; by Diaphoreticks, Sudorificks, and by letting of Blood. For (1.) *Fasting* tends directly to dissipation of the crude Spirits; because the Spirits, if not by intervals recruited out of new Supplies of Aliment, must necessarily be soon exhausted and resolv'd into Air. But no Mortal being able long to abstain from all sorts of Meat and Drink, or to endure absolute Fasting; we are therefore compell'd to substitute a *thin and spare Diet*, in the place of strict Abstinence; for the most part thin Broths made of things moistning, cooling, not prone to Corruption, Subacid, and of easie Digestion. To these (2.) are added moderate and grateful *Acids*, apt to attenuate, resolve and dissipate the Crudities congested in the Habit of the Parts, and therefore Predatory. (3.) *Diaphoreticks*, which promoting insensible Transpiration, must conduce to the dispersion and exhalation of the same Crudities. (4.) *Sudorificks*, which

do the same thing, but by a more expedite and conspicuous Operation, at once rendering the Crudities Fluxile, and exciting Nature to drive them forth by Sweat. For Medicaments of this Family, by the tenuity and mobility of their Particles, penetrate the inmost Recesses and slenderest Pores of the Body, cut, attenuate and rarefie Humours into Vapours, and irritate the Parts to expel them together with the *Serum* of the Blood, in the form of Sweat. But in the use of these *Hydrotick* Medicaments great Circumspection is required, lest the Matter of the Fever, being not yet mature and prepared for this Evacuation, be both importunately with too much Violence Exagitated, to farther corruption of the Blood, and increase of the Fermentation. So that they cannot be safely administer'd to impure Bodies, in the beginning, nor indeed in the Augment, until certain Signs of some Concoction have been observed. (5.) *Letting forth of Blood* by opening a Vein, which evidently detracts part of the Crude Matter floating in the Blood, and makes room for the remainder to be more freely Fermented, and prevents Eruption of the Blood out of its Vessels into some Noble Part.

To satisfy the *Second* capital Intention, various things are required; viz. such as may facilitate the Motion of Fermentation in the Blood; such as may moderate the same, when it is excessive in point of Velocity; such as may incite Nature to quicken and accelerate it, when too slow; such as may keep it within due Bounds, lest it bring a dangerous flood upon any Noble Part. For, the Motion of Fermentation is sometimes too *Turbulent* and Tumultuous, and in that respect exceedingly *Laborious*, requiring remedies to make it more sedate and easy: Sometimes too *dull* and *slow*, and to be quickened; sometimes it threatens a *Flux* upon some Nobler Parts, and then ought to be restrained. In particular, (1.) The *Laborious* Fermentation (which the Ancients seem to have meant by the name of *Orgasmus* or *Turgescentia*) indicates Remedies apt to compose it, and render it less prone to molest and offend the Vessels containing the Blood: Such as taking away some by *Phlebotomy*, which by diminishing the Mass, lessens the burden of Nature, and makes room for the

freer Fermentation of the rest, such also are *Acids* and *Refrigerating*, and *moistning* Juleps (not given actually Cold, but Luke-warm, nor in the least vinous) all which allay the ebullition of the Blood, and make it less prone to be Frothy. (2.) The too *swift* or vehement Fermentation, which makes the Fever more acute than the strength and spirits of the Patient can well bear, and by consequence ought to be moderated; requires Remedies that may somewhat retard it, and procure a truce to Nature, that the may have respite to recollect and rally her Forces. Of which sort are *Blood-letting*, *Anodynes*, *Hypnoticks*, and sometimes even *Narcotics*, either taken in the Mouth, or applied outwardly to places convenient.

(3.) On the contrary, the too *slow* and lingering Fermentation, such as causes *Lent* Fevers, calls upon the Physician for Spurs to incite and stimulate Nature to accelerate the Conflict. In this case therefore he ought to have recourse sometimes to *Purging* Medicaments, to be by Intervals Repeated; sometimes the *Sudorificks*, and those pretty Hot, Efficacious, vinous or rich in Spirits: For all these quicken the Fermentation, and dissolve the clamminess of the Febrile Matter, and in both those respects bring great Relief to the Patient. (4.) The *Turgent* Fermentation, which threatens a Flux upon some noble part and imminent danger thereupon; directs to the speedy use of the best means for *Diversion*. Here therefore the most urgent Symptom is without delay to be opposed, by Remedies *Revellent*, *Divertent*, *Repellent*; as *Phlebotomy*, *Cupping-Glasses*, *Leeches*, *Ligatures*, *Vesicatories*; and other *Topicks*.

In fine, the *Conservation of the vital Powers*, is in putrid Fevers of greatest Moment; because the Febrile Matter tends directly to the oppression of the vital Mication of the Blood, and the Fermentation it self proceeds no less from the Luctation of Nature; endeavouring to continue that Motion in which life consists; than from the Ferment that hinders it. Hence it comes, that the lighter causes of Fevers are sometimes discussed by *Cardiacks* only, by a bitter Decoction of Chamomil Flowers, and the tops of Wormwood, by *Carduus Benedictus* boiled in Posset-drink, and the like *Euporisa* or dome-

domestick Remedies. For, if the expansive Motion of the vital Spirits be so far assisted and corroborated, as to enable it to overcome the claimminess of the Febrile Ferment, that tends to the suppression of it; Nature certainly will soon obtain the Victory, and easily exterminate her Enemy. Here then is the opportunity of giving *Cordials* (as they are call'd) *Antidotes*, and *Specificks* or *Appropriate Remedies*, vulgarly so named: All which conduce to the *Conservation* of the *vital Faculty*.

Besides the just now described preparation of the Matter in putrid Fevers offending, to the opportune expurgation of it, there is required also a certain preparation of the *Ways* or *Passages*, through which the same is to be most commodiously carried off, that so the Evacuation, whether by Nature herself critically, or by her Minister the Physician artificially instituted, may be not only seasonable, but easie too and beneficial. For, these being, either by their *Asperity*, or by their *Narrowness*, or by *Obstruction*, less passable than they ought to be; to attempt Purgation, is vain and unsafe. Of which our Law-giver, *Hippocrates*, being fully conscious, left us this most prudent Counsel (*Aphor. 10. lib. 2.*) *Si quis corpora purgare voluerit, meabilia ut reddat, est necesse*. But how is the Body to be made more permeable? By opening all the Passages of it, and by cutting, dissolving and attenuating the gross and viscid Humours that stick in them: Which may be best effected, by Remedies *Lubricant*, *Abstergent*, and *Aperient*: The particular reasons of all which I shall endeavour briefly to explain.

(1.) *Lubricantia* certainly render the ways more fit to give Passage to Humours that require Purgation, by smoothing their roughness, and inducing instead thereof a manifest *Slipperiness*; so that the Humours slide along through them without any sensible Renitency or Attrition, which always causeth *Gripes* in the Stomach and Belly. Now of these Medicaments that are apt to induce Slipperiness, some are simply *Aqueous*, and remove Asperity only by their Moisture, as Barley-water, thin Broaths, Whey, &c. Others are *Mucilaginous*, smoothing the Ways with a certain friendly and pleasing Lentor,

as the Syrups of *Althaa*, of the Flowers of Mallows, *de Mucilagibus*, of Jujubs, &c. Others *Oleaginous*, as Oil of Sweet Almonds, Linseed Oil, Fresh Butter, Lard, &c. Others, *Saline*, as the Salt, Cream, and Magistery of Tartar. Others, *Spirituous*; as New-laid Eggs, but little boiled, the Pulp of ripe Fruits. Again of these, some *loosen* the Belly also; as the Pulp of *Cassia* and *Damasco* Prunes, which above all things temperate the roughness of purging Medicines, being for that reason chiefly admitted into the composition of the *Diaprun. Solut.*

(2) *Abstergentia* seem to have the like good effect, in facilitating the Operation of purging Medicaments; as Soap bath in cleansing of Linnen. For, whatsoever sticks to the inside of the Stomach and Gut, they wipe away; and are found, in that respect perhaps, to conduce much to the correction of strong and churlish Catharticks; by preventing their rough and grating Particles from pertinaciously adhering to the Coats of the Ventricle and Intestines, and so inducing Gripes and Contorsions. Hence 'tis familiar to Physicians to tame fierce Purgatives with Salts, viz. *Sal Gemma*, Salt of Tartar, of Nitre, Spirit of Vitriol, and of Nitre dulcified, *Cremor Tartari*, and the like. Not that they confer to the bridling of the fierceness of stronger Catharticks in this name only, but because they are usually prescribed chiefly to this end.

(3.) Nor are *Aperient*, i. e. cutting and attenuating Medicaments of less Utility in this Business, where the ways through which peccant Humours are to be educed, are obstructed by any vitious Matter cramm'd into them. For, Remedies of this *Classis*, by reason of the great Tenuity, acuteness and agility of their Parcels, penetrating into the smallest Vessels and Pores, and attenuating viscid and tenacious Humours therein sticking, open all Passages in the Body. No wonder then, if by rendering the clammy Matter of Fevers more Thin, Fluid, and more obedient to Nature, endeavouring upon irritation by Purgatives, to expel it; they conduce mightily to the more Facile, and more successful Operation of Purges. Nevertheless, we are to advert, that not all sorts of Humours are to be Fluxile, before any

any be exterminated by artificial Purgation: But that we are, in pertinacious obstructions of the *Viscera*, to act with *Aperients* and gentle *Catharticks* by turns. For, as there are degrees of Concoction, so likewise ought there to be degrees of Evacuation; and so soon as any part of the peccant Matter is decocted and prepared; we must attempt to carry it off; to the end that Nature being thereby exonerated of part of her Load, may with more Facility digest the Remainder; at least when we perceive her to be oppressed by too great Weight. Of *Aperients* some are *Hot*, which ought to be administered to Men of robust Bodies, and cold Complexion, and such as labour of inveterate Oppilations: Some *Cold*, which are proper for persons of hot Constitutions, and prone to abound to bilious or cholerick Humours: Others *Temperate*, and therefore most convenient to tender, soft, delicate and crazy Bodies. But these three sorts being judiciously temperate, mutually refract each the others Qualities, so as to reduce them to Mediocrity. Other differences of *Aperients* there are, which I must lightly touch. Some remove Oppilations by *attenuating simply*, without the least of Astringion; as the five opening Roots, the Bark of Tamarisc, and of the Roots of Capers, the Leaves of Maiden-hair, Hearts-tongue, Ceterach, and Fern Roots, &c. Others both open, and moderately bind; as Endive, Cichory, Agrimony, Rhubarb, Sage, &c. Others again are endowed with an aperitive Faculty, but are withal *vehemently Astringent*; as Steel, which hath no fellow. Now, as to the seasonable use of these Differences; in the *beginning*, *Aperients* without Astringion are most convenient, because they best dispose the Humours to Fluxility, and clear the Passages: Yet are they to be prescribed with this Caution, that the tone of the Parts be not by the importune use of them dissolved, or irritated to a Cruentation. The safer way therefore is, to mix with them one or two of the *second* Tribe, that have somewhat of Astringion in them. *Aperients moderately Astringent*, are indeed in themselves most safe; but they are given with best success after a general Evacuation. And more *vehement Astringents* are to be in reserve, to

finish the Cure, by restoring the weakened parts to their pristine tone and vigour.

But is it not plainly dissonant to reason, ye will say, that the same Remedies should be once both *Aperient* and *Astringent*? I answer, therefore, with Doctor Glisson; that *Aperients* and *Astringents* are not directly *opposite* each to the others. For, the contraries to *Aperients* are *Obstruents*; and to *Astringents*, *Laxants*. Besides, in a Chachexy and Dropsie, which either proceed from, or are commonly accompanied with great Obstructions; the natural tone of the Parts is always relax'd more or less. It must be confessed indeed, that in those Maladies the tension of the Nerves is for the most part too great, by reason of their continual irritation by vitious Humours: But nevertheless it cannot be denied, that their natural tone is less firm than it ought to be. If therefore *Obstruction* may consist with *Laxity*, why may not *Deoppilation* as well consist with *Astringition*?

And thus have I run over the three principal things prerequisite to Evacuation in putrid Fevers, viz. correction of the peccant Matter, conservation of the vital Mication of the Blood, and permeability of the ways. It remains only, that I adjust what hath been said, to a certain Rule of *Hippocrates*, that seems to render it doubtful. The precept is this (*Aphor. 29. lib. 2.*) *Ineuntibus morbis, si quid movendum videatur, move*: Which some perhaps may think plainly repugnant to the former Aphorism, upon the explication whereof I have so long insisted.

To reconcile therefore these two equally true Aphorisms, I must acknowledge, that it is *not always* requisite to expect a *Pepasmus*, or maturation of the morbidick Matter in Fevers simply putrid. For, there are various cases, in which, whether they happen to be single or concurrent, all the counsel of this latter Aphorism is to be preferred to that of the former. And all these Cases may be reduced to the number of Five.

The *first* is, when any vitious Humour, either by its abundance, or irritating Quality, or motion doth molest the Patient, in the first region of the Body, that is, in the Stomach, or Guts, or Pancreas, or Liver, &c.

&c. which requires to be speedily expelled upward or downward. For 'tis not to be doubted, but that a Physician may, and ought, in this case, to relieve molested Nature, as soon as is possible, by carrying off the irrequiet Humour by ways most convenient. And by the Oracle of frequent experience we are taught, that not only intermittent, but continual Fevers also, are much diminished, if not totally eradicated by safe Vomits or Purges administered in the beginning. For, the fœvent cause being taken away, the proximate cause is much more easily discussed; which seems not to be any Humour stagnating or congested, either in the *Viscera* themselves, or in their Confines, as hath been already shewn; but floating in the Mass of Blood within the Arteries and Veins. This therefore is not to be attempted by any purging Medicament, until Concoction hath preceded: And the latter Aphorism advising Purgation in the beginning of putrid Fevers, is restrained to crude Humours contained in the first Region of the Body; nor doth it respect the times of Diseases, so much as the strength of the Sick, (which is very rarely exhausted in the beginning) according to the judgment of *Galen* (*lib. ad Thrasibulum, cap. 38.*) who gives this reason of the Aphorism, *Quod natura, adhuc satis valida existens, detracta oneris quo premitur, parte, quod reliquum est & facilius ferre, citiusque concoquendo mitigare possit.* Hence it is, that not only *Clysters*, that rinse the Guts, but gentle *Solatives* also, such as may without any great Tumult or Commotion carry off any vitious Humour lodged in *primis viis*; are commended by the most experienced Physicians in the beginning of putrid Fevers.

The *Second* case is, when any Matter incapable of mitigation by Concoction, begins to shew its *Turgescence*, i. e. either from its abundance, or from its malign Quality, flying from place to place, induceth a frequent Mutation or shifting of Symptoms: All which *Hippocrates* comprehended in the Word *ῥῆξις*, which signifies *Rage* or *Fury*. Which for the most part happens in the beginning of the Fever; and then arise various Symptoms, and dangerous, according to the various Temperament, Irritability, A-

tion, Use, and Situation of the part upon which the turgent Matter rusheth. As for instance, in *Phrenetick* Patients we observe an admirable change of Symptoms; sometimes their Sight, sometimes their Hearing, sometimes their Tongue being invaded and disordered by the wandering Humour that causes their *Delirium*, and often shifts the scene of its tragical Fury. And the Reason seems to be this, that the intraged Matter of the Disease is so highly offensive to Humane Nature, that no part of the whole Body can suffer it so much as one moment of time, without uniting the Forces of all its irritated Fibres to squeeze it out, so that it is transmitted from some parts to others in a Trice. If it happen therefore, that any crude Humour be in this impetuous manner transmitted to any *Secretory* Organ (even though it be not redundant in the whole Body) a considerable part of it may be, by help of purging Medicaments, respective to that Organ, speedily carried off to the preservation of the Patient's Life. For, the Humour, so Turgent, and rushing into the Organ, doth by its very Motion irritate the Fibres of it to contract themselves vigorously to expel it; no less than if it were redundant in the whole Body. If the storm then fall upon the *Stomach*, the danger thence impendent may be easily prevented by a moderate *Vomit*, given before the Humour be removed to some other Part; if upon the *Guts*, a convenient *Purge* may serve to turn it downward. And yet I must confess, that such early Evacuations are commonly Tumultuous and Painful; as promiscuously educing all Humours they meet with; and therefore never to be instituted, but where the Matter of the Disease is Turgent.

The *Third* case is, when some little Portions of any one, or more of the *Analogous* Humours formerly described, chance to be carried, together with the stale and dead recrements of the Blood, to the *Secretory* Organs. In particular, when some of the acrimonious and corroding *Serum* of the Blood, is by nature therewith offended, transmitted, together with the *bilious* Excrement of it, to the *Liver*: Or some of the whitish and viscid *Grumus* of the Blood, together with the

the *Pituita emortua*, to the *Stomach*; or finally; some of the *aqueous* or potent Matter, with that of the *Urine* to the *Kidneys*. Because Nature tends that way, and being assisted by a convenient *Purge* in the first case; in the *second*, by a gentle *Vomit*; and by temperate *Diureticks* in the *third*; may continue the same course, until she has brought the remainder of the peccant Matter to a perfect *Crisis*.

The *Fourth* is, when any vitious Matter yet crude, is so redundant in the Blood, that nature, reduced to her last shift, is compelled to exclude it by *Parcels*, by any *Secretory* Organ, not by that which is most proper and congruous to the Nature of the Humour. As it happens in the *Yellow Jaundice*, when part of the corrupt *Choler* is separated from the Blood in the *Kidneys*, and makes the *Urine* Thick, Turbid and Yellow: And in that dreadful Disease call'd *Cholera*, and all the *Bilis* ejected upward and downward, is not concocted and truly Felleous, but for the greater part crude and

only analogous to that which is separated from the Blood in the *Liver*, and thence brought into the *Bladder of Gall*, and seems to be generated by a certain malign or venenous corruption of the Blood. For, improbable it is, that so prodigious a quantity of bilious Matter hath been separated from the Mass of Blood in the inmost Coat of the *Stomach* and *Guts*. In like manner, they who drink *Mineral Waters*, or *Wine* profusely, make *Urine* indeed in abundance, but thin and crude.

The *Fifth* and last Case is, when the Ferbrile Fermentation appears to be slow and lingering. For, here 'tis lawful, by just intervals, to ordain Evacuations by milder Catharticks; not only in respect of the *Focus*, which in such cases is wont to be recruited often, and therefore requires to be substracted by repeated Evacuations; but also that the Fermentation it self may be quickned, and so nature excited to perform her work of digesting the Crudities with more Vigour and Expedition.

A Continuation of Fevers in general and particular: From Mr. Chaillon's enquires of the Origine of the Motion of the Blood, and other Humours in the Humane Body: Michaelis Praxeos Chemicæ Generalis, Willis, Sydenham, Morton, and Cole of Fevers, Small-Pox, Measles, &c. With an account of the Cortex, and some other Specificks; From Paxton, &c.

THE Fever in general is a foreign Heat and disorderly Motion of the Blood, which being contrary to nature endeavours to destroy it by attacking first of all the Heart, then the other parts of the Body, where being distributed by the Arteries, with the Blood and vital Spirits, it disturbs or interrupts their Functions.

The Fever is divided by *Galen* into three Parts, because of the three subjects where the igneous heat is said to reside. In the *Ephemera Fever*, when there is an Inflammation in the Spirits; in the *Humorale* when the Fire is in the Humours, and in the *Hætick*, when in the solid Parts.

We shall establish three general Heads, under which all Fevers may be rang'd; Namely, the Simple, the Putrid, and the Pestilent Fever. The Simple Fever is an Inflammation, or an excess of Heat that is preternatural, without Putrefaction, of which there are three kinds; the *Ephemera*, the *Synochus*, and the *Helick*. The *Ephemera* is an Inflammation or Disorder that chiefly effects the Spirits, by which it is communicated to the whole Body; but the substance thereof being thin, subtil and airy, it vanishes and easily disperses it self, and seldom lasts above a Day; we divide this into two, to wit, the True and the False.

The Simple *Synochus* is generated from the effervescence of the Blood which is too hot in the Veins and Arteries, always without Corruption; it lasts longer than the *Ephemera*, because the matter affords more Resistance. The *Helick Fever* is a preternatural Heat, adhering close to the solid Parts. There are two sorts of this, the one Universal, whose principle seat is in the Heart, from whence it is convey'd to all the parts of the Body; the other is Symptomatick, and is lodg'd in some particular Part, as the Lungs, the Liver, the Stomach, Spleen and Reins, which communicates it self afterwards to all the other Members. There are several degrees to be observed in this *Fever*, the first is when the moisture which is a Dew with which the parts are water'd is dry'd up: The second degree is when the substance of the Flesh is wash'd away: And the third when the heat dries the fibrous and solid Parts: It is still to be observed that the *Helick Fever* is sometimes Simple, and sometimes attended with a *Putrid Fever*.

The *Putrid Fever* is formed from a corrupted Humour which seizes first on the Heart, afterwards on the other Parts; of which there are two sorts, to wit, the Continued and Intermittent. The continued is of one or two kinds, the one true and essential, and the other Symptomatick: The true and essential continued Fever is not confined to any particular Member, but is contained in the large Vessels, and from thence by its Energy, powerfully infects the Heart without Intermission, and consequently the vital Spirits, with these differ-

ences. The first *Putrid Synochus* which is without encrease of Fever takes its Origine from an equal mixture of the Fluids, that are put into the like effervescence: The second *Synochus* or continued Periodical Fever, has some increase, and some relaxation in certain Days, but altogether without Intermission: This difference arising from the diversity of the Motion of the Humours, which still end in a Putrefaction: They make still a third difference, to wit, the Tertian or continued Bilious Fever, the Quartan or continued Melancholy, and the Quotidian or continued Pituinous Fever. All the continued Fevers are either equal from the beginning to the end, or else they encrease or decreate.

The Symptomatick Fever proceeds from the Obstruction, Inflammation, or Corruption of some of the *Viscera*, and from thence communicated to the more Noble Parts; it is greater or lesser, stronger or weaker, according to the part from whence it comes, or wherein it is seated: These Symptomatick Fevers, sometimes attend *Phlegmons*, *Erysipelas*, large Wounds, Inflammations, and Obstructions; they likewise come from Worms, corruption of the Milk, *Semen*, *Fluor Albus*, &c.

As to the intermitting Putrid Fevers, it is either Simple, Compound or Confused, and its seat is amidst the *Viscera* of the lower Belly, which contains the parts that are water'd by the Branches of the *Vena Porta*, and by those of the Cæliack and Mesenterick Arteries, as the Stomach, the Epiploon, the Gall Bladder, Spleen, Pancreas, Mesentery and Intestines. The Simple is divided into the Tertian, Quotidian, Quartan, and some add the double Tertian, which is the fifth Day, the Seventh, the Ninth, and all that have any Intermission, but these are much rarer than the three first; all these Fevers are called *True* or *False*.

We must suppose that for an Intermittent Fever, some heterogeneous thing is mixed with the Blood, whose Particles in regard they are not assimilated, make so long an ebullition of the same, till either being subdued, they are rendered unsoluble, or being subtilized, they are sent forth; wherefore such Matter being subdued or sent forth, the Fit ceases; and when this Matter springs or rises.

rises a fresh, it causes a new Ebullition, and consequently a new Fit happens. Secondly, As to the shivering and cold, preceding the heat in this effect, doubtless the true and genuine cause of those is the flowing and turgency of the nervous Juice degenerated into another Nature, wherewith the Spirits and Heat being charged are abounded, and the nervous Bodies being irritated are put into a Trembling; but afterwards when these Particles, being in part protruded to the superficies of the Body, the Blood is somewhat freed from their Cumbrance and Oppression, and joyning with the *Serum*, they evaporate by Sweat, or insensible Perspiration. Thirdly, From what is said, it will be easie to shew the causes of the Intermission, and of the set Returns, *viz.* the Intermission follows because the Morbifick Matter is all clear'd at one Fit, and so till a new one be brought in place, an intermission follows of necessity. Now a new matter begins to be generated from the time that the last Fit ceased, and when the Blood is fill'd again to a Turgescency, it boils and comes to a flowing.

As to the set returns of the Fits, these happen because for the most part the nutritive Juices is supplied from the *Viscera* to the Blood passing in the Veins in an even Measure and Quantity, though sometimes if the Persons who have *Intermitting Fevers* gorge themselves too much, or are very abstemious, the Fits happens sooner or later than usual. If it be ask'd wherefore the set Returns of Fevers are not of one kind, and of the same distance, but that some come every Day, some every third or fourth Day; the cause is the different Constitution of the Blood, whereby it is perverted from its due Temper, into a sharp, acid or austere disposition. According to this differing Dyscrasie, the nutritive Juice fresh brought, falls more or less from its Maturation, and is perverted into a Matter sooner or later apt to ferment.

We call a *Tertian Fever* not that which happens at three Days distance, but inclusively from the day in which one Fit begins on the third thence another returns; mean while, sometimes if the Fits are long, *viz.* protracted to 24 Hours, and withal come before the usual time of their Accesses, the

space of intermission is often less than 24 Hours. The essence of a *Tertian* consists in the sharpness and heat of the Blood, which sets the crude nutritive Juice like new Beer a fermenting, from whence proceeds first a cold with shivering, and afterwards the vital Spirits prevailing, a burning with intense heat through the whole Body, and then upon separation of the Fluids after the conflict is over, the *Serum* is sent forth through the Pores of the Skin, which we call Sweat.

A *Tertian Fever* is wont to be common in the Spring, when the Blood is most vigorous, and impregnated with Particles of Salt and Sulphur; but if this Disease continue, it is the cause of many Distempers; for hereby the Mass of Blood is impoverish'd, wherefore a Jaundice, Scurvy or Cachexy follow upon this Fever, when long a curing: For by the frequent Fits the Spirits evaporate, the Muscles loose their Spring, and the strength decays. Besides, a continuance of this Disease, often changes it into a *Quotidian*, *Quartan*, or double *Tertian*; all which tend to weaken the Body, and emaciate at last the Patient to a meer Skeleton.

Certain Symptoms are wont to happen upon this Fever, which are commonly reckon'd for the *Crisis* of this Disease; as *breaking out of the Lips*, a *Jaundice*, and a *Phlegmon*, suddenly rais'd in any part of the Body, though notwithstanding such irruptions of the Lips, the Fever has continued obstinate sometimes; wherefore it is to be observed, if upon sore Lips, the Fever does not remit, it will prove of long continuance and severe. Sometimes a *Jaundice* happens upon a *Tertian Fever*, and puts an end to it, the reason is, because when the Blood has gotten a sharp or bilious Disposition, that thereby it changes the nutritive Juice, it is often freed from that Dyscrasy, when by a sudden Excretion, the recrements of the adust Gall are freely purged. When a *Phlegmon* happens upon this affect, it is commonly said that the *Ague* is fallen into the place swoll'n: Now it is no strange thing that the Disease is determined by such an Abscess; because the Blood by this means continually serves from it felt the store of the degenerated Mass, and conveys it to the part affected; so the Disease is sometimes

help'd by a *Metastasis* of the Febrile Matter from one place to another, as a Toothach, Deafness, or the like, happening on a sudden.

As to the Cure, that the Blood may be reduced to its natural Temper, Vomits, Bleeding, and Purging are of great use, especially in the beginning of the Disease. *Vomits* do good by forcing the Choler plentifully from the *Meatus Choledochus*, emptying the Gall-bladder, and so cleansing the Blood from the adust Bile; besides they strengthen the Stomach, and prepare it for a better Digestion. Opening a Vein cools and ventilates the Blood, and makes it circulate more freely in the Vessels. Purging draws plentifully the Bile from the Gall-bladder, and viscid Humours from the Coats of the Guts, and consequently purifies the Mass of Blood. The second intention is perform'd by Diet, and a Regimen or Method of Living; spare thin feeding is the best, to put off the feverish access beyond its usual time, and sometimes it will overcome the Disease; therefore thin Aliment is to be made use of, as Barleybroth with or without Fruit, and likewise such as is made of Veal, Lean Mutton, an old Fowl, &c. In the third place the Fit is stop'd by Remedies, which check'd the fermentation of the Blood: And though this hath been look'd upon by Physicians, as Empirical, Immethodical, and the like, yet Experience shew, that these Fevers have been often cured this Way; though you must observe that the use of these after Bleeding and Purging will do the most good; and unless these are duly premitted, those others seldom stop the Fit.

By this plain and easie Method following, several *Tertian* Fevers have been cured in a short time, *viz.* by purging, with an infusion of *Sena*, and *Rhubarb*, in Whey, or Milk Water, with a Topical *Febrifuge* apply'd to the Wrists, or a Plaster to the Pit of the Stomach, and at Night going to Bed give Conserve of *Roses*, half a Dram, Tartar Vitriolate 4 Grains, *Diaf-cordium* a Scruple, and every Morning after Purgation half a Dram of Salt of Wormwood and Tamarisk in a Spoonful of Juice of Oranges. But if the Fever grow worse and worse and the diseased Languish,

Catharticks being laid aside, we ought to insist on such Medicines then as restore the dejected Strength, fuse or dilute the Blood, and drive away the ferous Impurities by Urine, together with such things as strengthen the Tone of the *Viscera*, and exhilarate or refresh the Spirits: For this end Apozems of Diuretick, Aperitive and Stomachick Herbs and Roots are excellent; together with Alixipharmick, and Sudorificks, as *Lapis Contrayerva*, *Virginia Snake Root*, Antimony, Diaphoretick, Salt of Tartar, and the Testaceous Powders: When the *Crisis* of the Blood is somewhat better, then Remedies may be profitably given for stopping the *Paroxysm* or Fit of the *Fever*: For which purpose let *Febrifuge* Epitheims be apply'd to the Wrists and Soles of the Feet: The Peruvian Bark in substance or in Tincture, by the Mouth or in Clysters; so Opiates of Laudanum, Liquid and Solid, *Matthews* and *Hounds Tongue* Pills; also of the Bark of the Ash, Tamarisk, or of Gentian, given in White-wine, with the Salts of Wormwood, &c.

Next after a *Tertian Fever*, by reason of their Affinity follows the *Quotidian*, which returns every Day: In this the Symptoms Heat and Cold are more Remiss, but the access holds longer, continuing sometimes 18 or 20 Hours. This Fever frequently succeeds a *Tertian*; for when the Spirits are much spent, the Blood becomes weaker, and is not brought to Perfection, therefore is sooner converted into a Matter almost wholly subject to Fermentation. Sometimes it happens that a *Quotidian Fever* arises first without a foregoing *Tertian*, *viz.* when a feverish affect seizes a Body that is Cacochemical; for then the Blood being poor in Spirits perverts the nutritive in greater store, and so changes it into a *Tertian*. An intermitting *Quotidian Fever* is not so easily cured as a *Tertian*; for whether that comes first Simple, or follows upon another, however it is raised from a stronger cause, and argues a greater Dyscrasy of the Blood, which does not presently yield to Remedies.

In this case Vomits, if the strength will bear them, will be of use above the rest; also purges must be often repeated, especially such as are made with the aperitive and bitter

bitter Herbs; as Rhubarb infused in Cinnamon and Wormwood Water Compound, or *Gercon's* Tincture of Gentian, made with *Sena*: Besides these, digestive Remedies and Deobstruents which restore the Ferments of the *Viscera* and Blood, are frequently to be used: Wherefore fix'd Salts Tartar, Wormwood, Succory, Tamarisk, &c. with the acid Spirits, Elixirs, and Tincture of Minerals, as *Mynsicht's Elixir Vitrioli*, and sometimes preparations of Steel do well: To the Region of the Stomach apply a Plaster of Gum, Tacamahaca, Ladanium, Balsam of Peru, Oil of Wormwood and Mastic, or Mint; or make a Fomentation upon the Belly, and Stomach, with the Leaves of *Roman* Wormwood, Centaury, Southernwood and Agrimony boil'd in White-wine, with Gentian Roots, and give frequently *Elixir Proprietatis* 6 or 8 Drops, in 4 or 5 Spoonfuls of Magistral Water of Earthworms.

In a *Quartan Fever* or *Ague*, the time for the return of the Fit is longer than in the rest, it being extended to the fourth Day inclusively, and is used to be of longer continuance, and more difficultly cured; for this Disease is protracted for many Months, and often Years, and seldom or scarce at all yields to Medicines. The Fit for the most part begins with a Cold and a Shaking, which are followed with a pretty troublesome Heat, but more remiss than in a Tertian; Sweat for the most part concludes the Access. If the Disease remains long it brings the *Scurvy*, or Hypochondriack Melancholy, or seldom fails to involve whoever hath had it in an ill Habit of Body all their Lives after. The reason why this Disease is of so difficult a Cure, and so obstinate, is from the viscous Constitution of the Blood, and the Lensor therein, which is not easily removed; for there being in it a scarcity and defect of Spirits, from the depravity and vicious Disposition of it, there is need that the whole Mass be Volatilized, and that it Spiritualises, as it were anew. Wherefore in this case evacuations do not the least good, nay by impoverishing the Blood, with Oil remedying it, they must necessarily impair the Strength.

The Remedies then which only give relief in this case are such as stop the Fit of the

Fever; the chief or principal of which is the Bark, taken in substance from 1 Ounce, to 1 Ounce and a half, betwixt one Fit and the other, which is about a Dram every third Hour in any convenient Vehicle, or made into a Bole Electuary, &c. In the first place then it may be observed that this Medicine inwardly taken, acts first on the Coats of the Stomach and Bowels, and then on the Mass of Fluids, as it is by degrees protruded through the Lacteals; for till its vertue be communicated to the Blood, its antipyretick force is not at all Exerted, wherefore the Fit next ensuing is not always prevented, but the second or third after its being taken.

As to the sensible Qualities with which this Bark is endowed, it is manifest that it excels in Bitterness, with a certain Stipticity, that by the taste it is discovered to carry in a manner the Relish as is usually found in most, or rather Abstinence, cooling Drinks, evacuation of the Excrements by Clysters, but above the rest, Sleep and Ease do most good, which if wanting they must seasonably be procured by *Opiales* and *Anodynes*.

A *Putrid Fever* is when the oily or sulphurous part of the Blood being too much Heated, grows turgid above measure, and is brought as it were to a Flame, and therefore its likeness to humid things putrefying, which contract a Fervour, is call'd a *Putrid Fever*. The Liquor of the Blood being thus rarefied, stretch the Vessels, velleicates the Brain, and nervous Parts, raises Cramps and Pains in them, very much consume the vital Spirits by its Effervescency, destroys the Ferments of the *Viscera*, hinders the Functions of the Stomach, and Intestines, depraves the nutritive Juice sent into the *Genus Nervosum*; nay and perverts in a manner the whole Oeconomy of Nature.

The *Procataretick Causes* which dispose to this Disease are a hot, moist, Temperament, an athletick habit of Body, Youth, the Spring or Summer Season, a plenteous and rich Feeding, hard Drinking, a sedentary Life, a Body Cacochemical and full of ill Juices. The *Evident Causes* which draw the latest disposition of this Fever into act, are of the kind as those which bring an *Ephemera*

mera, and a *Synochus Simplex*; especially *Perspiration* impeded, and *Surfeiting*; because in the first the *Effluvia*, being restrained, the Mass of Blood increasing in Bulk grows Turgid; and by surfeiting both an immoderate Fermentation is caused in the Blood, and also a Nitro-sulphureous Matter, is conveyed as fuel into the inflam'd Blood. In this *Fever* four *Stadia* are to be observed, by which as by so many Stages its course is perform'd; and they are the *Beginning*, the *Encrease*, the *Height*, and the *declining State*, these pass over in some sooner, slower, and in a longer time. The *Beginning* ought to be computed from the time that the Blood begins to grow Hot, the *encrease* from the Mass being loaded with adult Particles, that the Fermentation rises: The *height* of the Disease is to be accounted from the fulness of the Matter, when it comes to a *Crisis*: The *declining State* follows after the *Crisis*, when the Inflammation grows weak.

When therefore any one is seized with a *Putrid Fever*, for the most part a cold Stiffness, or a shivering accompanies the first Invasion, which is followed by a heat that is unequal, and not as yet intense. The increase of this Disease is computed from the time that the burning Fever has got Possession of the whole Mass of Blood; therefore the *height* of a *Putrid Fever* is that time that the Disease in which Nature attempts the expulsion of the adult Matter, remaining after the deslagration of the Blood. A *Crisis* in a continual Fever is in a manner the same as the Fit of Intermittents; for as in these when the Mass of Blood is saturated to a fulness, there happens a flowing, secretion and expulsion of the Matter; therefore as to what some say, that the *Crisis* depends altogether on the influence of the Moon, &c. It is false; because Evacuations are determined only by the Turgescency of the adult Matter, whose Particles if they can easily be separated from the Blood, and the Pores of the Skin are but open enough, being involved in the *Serum*, Alexipharmicks, such as the Root of Gentian, Serpentry, Contrayerva, &c. for things which are actually bitter are mighty powerful in suppressing the force of the preternatural Ferments: Nay Cinquefoil, Agrimony, Ca-

momil, and Centaury, were formerly of famous use for curing Quartan Agues.

A *Continual Fever* is that whereof the access is prolong'd to many Days without any Cessation, it has its times of *Remission* and *Exacerbation*, but none of *Intermission*, the burning sometimes is more *Remiss*, sometimes more intense, but the Diseased is still in a Fever, till the Disease be wholly solv'd by a *Crisis*, or an insensible Recovery. Now there are three degrees or manners of Effervescency, by which the Species or kinds of continual Fevers are determined: From the subtle Portion of the boiling Blood, or from the ebullition of the Spirits arises the *Ephemer*, also the *Synochus* of one or many Days: From the sulphureous or oily part of the Blood too much heated and kindled is raised the *Putrid Fever*; Thirdly, on a venomous *Miasm* infecting the Blood, and congealing its Liqueur, Malignant Fevers depend; in each of these from the Depravation, or rather corruption of the nutritive Juice, fresh heap'd together in the Blood, various Paroxysms, inequalities and critical Notions arise.

An *Ephemer* Fever, and a simple *Synochus* seldom begin without evident Cause; besides the things aforementioned, immoderate Labour, Watchings, a sudden Passion of the Mind, a constriction of the Pores, Surfeiting, a Bubo or Wound, in Child-bearing an increase of Milk: The *Procatartick* Causes which dispose then to it, are a hot temper of Body, an Athletick Habit, a Sedentary Life, and disuse of Exercise. Concerning the Solution or *Crisis* of an *Ephemer*, and of a *Synochus* not Putrid, there are 3 things chiefly requisite, viz. A removal of the evident Cause. Secondly, a dividing or distillation of the depraved or excrementitious Matter from the Mass of Blood. Thirdly, An appeasing or quieting the Spirits, and their restitution to a natural and even State.

The evident is easily removed; because no person in a Fever upon drinking Wine, continues still to drink it; when a person grows hotter than usual by use of a Bath, or of the Sun, it is troublesome to him to continue in it longer. Secondly, As to the excrementitious Matter that ought to be separated

parated from the Blood, this is either from without, as by Surfeiting, Drinking, &c. when the Blood is infected with hot Effluvia's or Corpuscles; or else inwardly, as when upon the deflagration of the Blood, its Liquor is stuffed with adust Particles; both these Matters must be separated, and sent out from the Blood by Sweat, insensible transpiration before the Fever is appeas'd. The evident cause being removed, together with the offending or peccant Matter, the Blood is to be allay'd by degrees, to which chiefly conduce Bleeding, a very thin Diet, they are sent forth by Sweat; and this is the best way of a *Crisis*, which if it succeeds well, it often at once puts a perfect end to the Disease, without fear of Relapse.

As to the Event, whether the *Crisis* will be good or no, certain foreknowleges are taken from the strength of the Patient, the Pulse, Urine, other signs to the concurrence of Symptoms: That is if the Pulse be strong and even, the Urine be of a middle Consistency, with a separation of Contents, if the Disease proceeds without violent Vomiting, Watchings, a Frenzy, convulsive Motions, and a suspicion of Malignity, there be a good *Crisis* expected; but if the contrary to these happen, there is no good to be hoped for. When the Disease is come to the height, either the thing is brought to distress at one Conflict, and thenceforward there is a manifest Tendency to health with a Declination, or to Death. Or there are frequent struggles betwixt Nature and the Disease, and critical Motions are often attempted: By the word Declination or Declension I understand the Condition of the diseased, and the Disease which follows the height of it, whether it tends to a Recovery, or to Death; whether the Fever or Life it self declines.

The most observable Symptoms and Signs in a *Putrid Fever*, are first the heat which is perceived in the whole Body. Secondly, A spontaneous Lassitude. Thirdly, The great trouble of the *Præcordia*. Fourthly, The almost unextinguishable Thirst. Fifthly, The burning and roughness of the Tongue and Throat, with the growing of a certain white, yellow or black Fur upon it. Sixthly, Sometimes it happens that the Tongue, Palate, Gums, nay the Cavity of the whole

Mouth and Throat are cover'd with a *viscons Matter*. Seventhly, A Head-ach is raised in Fevers, by reason of the *Meninges* of the Brain being twitch'd by Vapours, and a sharp inflamed Blood. Eighthly, Watchings, Delirium and Frenzy sometimes arise from the Blood, making an Effort, and so raising disorderly Motions in the Brain. Ninthly, Convulsive Motions happen from various Causes. Tenthly, Swooning is procured many ways in Fevers. Eleventhly, A *Cardialgia* happens when the Stomach, especially its Orifices are beset with a sharp, bitterish, or else an acid corrosive Humour. Twelfthly, Nauseousness, loss of Appetite, Vomiting, &c. are the immediate products of the Fevers. Thirteenthly, Nor is a Looseness a less frequent Symptom, which sometimes happens in the beginning of the Disease. Fourteenthly, The *Bloody-Flux* is an affect so frequent in continual Fevers, that in some years it becomes *Epidemical*. The inspection of Urines has more of certainty than in any other Diseases, and is of very great Use; for hence the *Stadia* of the sick Person, and the Disease are excellently well known, and the Physical intentions concerning things to be done are hence best directed. As to the *Prognosticks* to be taken from Urine, we observe, that somewhat a remis colour of the Urine, a moderate Consistency, a few Contents subsiding or gathering in clouds portend good; on the contrary, an intense redness, thick Consistency and gross Contents which subside not to the bottom; denote a great Effervescency.

Of the signs and cure of the *Putrid Synchus* or continual Fever; - this is divided into a Symptomack, and an essential one; that is said to be Symptomack, which derives its Origine from some Affect or Disease first raised in the Body; so that the Fever is only the Symptom coming upon the other, as a Quinsy, Pleurisy, Wound, Ulcer, or the like, among Symptomackal Fevers, they place that which is call'd *Fbris Lenta*, those that are troubled with this grow hotter than they ought, especially after Meats, or any Motion or Exercise, the Urine for the most part is Ruddy, the Spirits are Weak, and the strength Digested; but the Fever which deserves most called

called Symptomatical, is that which is raised in Phthysical Persons from an Ulcer or Consumption of the Lungs.

The essential *Putrid Synochus* is wont to be divided into the *Putrid* as above described, into the *Causus* or most sharp burning Fever, and into the *Quotidian*, *Tertian* and *Quartan*. A *Causus* or *Burning Fever* is that which performs its course with a great burning, an intollerable Thirst, and other Symptoms, shewing a mighty Inflammation of the Blood: Its formal Nature wherein it's different from the rest consists in this, that the Temper of the Blood is hotter, therefore when it rages it is kindled in greater Plenty, its Motion is acute, and soon comes to the Height, it is attended with more horrible Symptoms than others, it has a difficult *Crisis*, and its event is very dangerous.

Concerning the Cure of *Putrid Fevers* there are four general Intentions, and as to the particular Remedies with which those Intentions are answered, there are various Prescripts and Forms of Medicines ever in use, which it will not be needful for me to repent in this place, but only set down briefly some of the chief Indications and Physical Cautions which ought to be observed in the course of this Fever, according to the various Seasons and Symptoms of it. About the first Invasion of this Disease, you must endeavour that the Fever be forthwith suppressed, and that the Inflammation of the over heated Sulphur be stop'd, to which breathing of a Vein chiefly conduces; moreover let a thin Diet be ordered; let the *Viscera* and first Passages be freed from the load of excrementitious Matter; wherefore a Clyster will be of necessary use; sometimes also Vomits and gentle Purges, which being now and then given seasonably will presently extinguish the Fever. When the Fever is in its increase, if the Blood boils too much and extends the Vessels, with a vehement Pulse, if Watching, Frenzy or Head-ach violently press; Bleed a second time, and let as free a Transpiration, as may be, be procured. Clysters are given with safety, and indeed with good Effect, but let Catharticks and Diureticks which too much exagitate the Blood be avoided: Also Julips and Decoctions which cool the

Bowels, qualifie the Blood, and refresh the Spirits, are frequently to be given, with acids of Vegetables or Utinerals, which restrain the Motion of the Blood, and quench Thirst: In case the Head is violently affected, apply *Epithemes* of the warm Fleth, or inward Parts of Animals to the Feet.

When the Fever is at the height, let the Motion of Nature be diligently minded, whether it be about to make a *Crisis* or not; wherefore nothing is to be done or attempted rashly by a Physician, breathing a Vein, or strong purging are wholly forbidden; but afterwards upon the abating of the Symptoms in case the Motion of Nature be Sluggish, a Sweat or gentle Purge may be procured; but if all things be crude and in a Perturbation; the Urine still troubled without Separation, if the strength be Faint, the Pulse Weak, if no *Crisis* or only a fruitless one has preceded, any Evacuation must not be attempted, mean while let the strength be refresh'd with temperate Cordials, let the immoderate effervescence be stop'd, and its due Fermentation be maintained, which is excellently perform'd by Coral, Pearl, and those kinds of Powders which are dissolved by the Ferments of the *Viscera*: In the interim let all Obstacles be removed, especially the first Passages cleansed by Clysters. In the declining State of a Fever; when after a perfect *Crisis*, Nature has gotten the upper hand of the Disease, things are in Safety; nor is there much left for a Physician to do: It only remains to propose an exact form of Diet, that the diseased may soon recover their Strength, without fear of a Relapse.

Besides the continual Fever, such as described before, and which arises by reason of some principle in the Blood exalted too much, and disproportionate with the Rest; where is another Species of it, which is raised by reason of the Blood being tainted with some venenous *Miasm*, and thereupon ready to incur various Coagulations and Corruptions, in which not only the Spirit and Sulphur as in a Putrid Fever, making an exorbitant Effort, and force the Blood to boil immoderately, but withal, the mixture of the Blood is forthwith dissolv'd, and its Liqueur runs into Parts; under this Head we comprehend Malignant and Pestilential Fevers

Fevers, the Plague, Small-Pox and Measles concerning the two last, of which we shall only treat. As to the Origine of the *Small-Pox*, they have a Seminary Connate Principle to us proceeding from the impurity of the Blood, conceived in the Womb with the first Rudiments of the *Fœtus*: But as to the Affects, they produce preternatural Symptoms, and venomous as the Plague it self, so that they constitute a certain peculiar sort of Fevers, which belong to all Mankind, and only to them; and that but once. If happily any one lives free from them all his Life, or some one falls often into those Affects, these are rare, and unusual Events of Nature; which do not derogate from common Observation, but it may pass for a Truth, that all and only Mankind are obnoxious to the *Measles* and *Small Pox*, and that they are usually freed of them at once.

The evident Cause which stirs these fermentative Seeds, and oftentimes brings them into Act, is said to be threefold, viz. Contagion received from elsewhere, the disposition of the Air, and an immoderate Perturbation of the Blood and Humors: Persons related soon infect each other, also those that are fearful and mightily dread this Disease, fall more readily into it, for by fear the Particles of the *Miasm* are convey'd from the Surface of the Body inward: At the time that the Contagion is rife, and the *Small-Pox* is Epidemick, all other Diseases in a manner degenerate into this. The *Miasm* of the *Small-Pox* is as a Ferment, but corruptive, that forces the Blood to ferment, not towards a Perfection but Depravation; for when the venomous Particles of this *Miasm* light on a capable Subject, they presently stir up Corpuscles like themselves, and innate to us, with which being joyn'd they pervade the whole Mass of Blood, and make it Swell or grow turgid in the Vessels; the Portions of this Blood being congealed with the Venom, about the 4th Day, sometimes sooner, sometimes later, begin to break forth; for the Coagulation is not caused presently, but after some time that the Venom displays it self, and by its effervescence ferments the Blood: First light Portions of the Blood being defiled, and those but few in Number, are fix'd in the Skin like Flea-

bites; soon after these more appear, and those which brake forth first by the Access of new Matter, and by the continual Appulse of the coagulated Blood, grow bigger and are rais'd into a Tumour: Afterward these Pusles which at first are Red, being increased by degrees, at length turn White, to wit, the extravasated with the Venom, by reason of the Heat and Stagnation, is chang'd into Pus. About the seventh day after the Eruption, the white Tumours turn to a dry Scab; for the more subtle part of the matter being evaporated the rest grows hard, which at length, the Scarf-Skin being eaten off, and broken falls from the true Skin or *Cutis*.

When the *Miasm* of the *Small-Pox* is once gotten into the Spirits and Mass of Blood, it is very seldom that it can be destroy'd or clear'd off, by Medicines or Bleeding, but the latent disposition will break forth into it; wherefore, first it diffuses it self gently, and inspires the Mass of Blood as it were with a Ferment, hence an Ebullition and Effervescence are produced in the whole Body, the Vessels are extended, the *Viscera* are irritated, the Membranes are twitch'd till the Seed of the Contagion, by fusing and coagulating the Blood, at length being involved in its congeal'd Portion are thrust forth. The Essence of this Disease will be better known if I set down the Signs and Symptoms, which are observed in the whole course of it, and give you in order the reasons of them, and the Causes on which they depend: Now there are either such as indicate the Disease present, or such as fore-shew the height of it, and its Event.

As to the Diagnostick of this Affect whereby it may be known whether any one at first falling Sick will have the *Small Pox* or not. There must be consider'd at that time the force of the Contagion, and the concurrence of the Symptoms first appearing; for if by reason of the malignant Disposition of the Air, this Disease generally Reigns, no one is then seized with a Fever without a suspicion of the *Small-Pox*, especially if the person never had it before: But if it be more rare, and there be no fear of Contagion, the Signs and Symptoms following will discover it.

First there is an inconstant Fever, coming at Random, sometimes Intense, sometimes more Remits, observing no form of increase or coming to a Height, so that the Patient is sometimes Hot, and by and by without any Fever at all. Secondly, A Pain in the Head and Loins is so peculiar a sign in this Disease, that it alone in a continual Fever, signifies an imminent *Small-Pox*. Thirdly, A great irksomeness and Restlessness, and sometimes a Swooning infest the Diseased, by reason of the irregular and tumultuous Motion of the Blood. Fourthly, A Vomiting to excess, even when the Stomach is free from an impure Mass of Humours, very often accompanies this Affect: To these may be added; in the Fifth place, the Symptoms which according to the various Dispositions of Bodies, happen after a various manner, as are, a great Sleepiness, frights in Sleep, Deliriums, Tremblings and Convulsions, a Sneezing, Heat, Redness, a sense of pricking in the whole Body, involuntary Weeping, a sparkling and itching of the Eyes, a swelling of the Face, a vehemency of Symptoms from the beginning, that the Disease seems presently, to have reach'd its Height.

As to the Prognostick of this Disease, it is indicated either to be safe; mortal or doubtful by supervenient Signs. First, Things seem to be in safety when this Affect has benign Circumstances; to wit, when it happens in a good Disposition of the Air, and of the Year, at a time when the *Small-Pox* is not Malignant; also there is less danger in Childhood, or Infancy, or in Families where the Disease has not been Mortal: If about the fourth day the Fever and the most pressing Symptoms abate, and then some red Spots begin to appear, if the second day of their appearance a great many more are Conspicuous, which afterwards grow by degrees into *Pustles*, and are ripen'd into *Pus* or Matter; if about the Tenth Day after the irruption the white *Pustles* begin to grow Hard, and afterward to fall off by little and little; if after the time of their first breaking forth, the *Small-Pox* are soft, separate from each other, are few and round, possessing only the Skin and the inward Part, we may judge the Patient to be in a good State.

Secondly, The *Phænomena* which denote the case to be suspected and full of danger are these; if there be a Malignant Constitution of the Air, that the Disease is become Pestilent: If Persons well grown in Years are seized with it, if it chanceth in a foul and cacochemical Body: If any *Viscera* are infirm, or if the habit of the Body be too gross the *Small-Pox* does not happen without great danger of Life: If there be a mighty Thirst, and a difficulty of Breathing; also a Looseness or Dysentery they shew that Perspiration is hindered, and the Malignant Humours reflagate toward the inward Parts: If they break forth slowly they argue a weakness in Nature; if double and confluent they shew that there is an excess in Quantity, and a Confusion, as well as irregular Expulsion of that Matter, since it is not thrown out at determinate Plans and Pores: *Small Pox* which are hard, signify the stubbornness of the Humours to Flux; if black Spots appear, or such as are familiar in a purple or pestilential Fever they shew a mighty Malignity and Corruption in the Blood; in short, black, livid or green *Small-Pox* threaten ill; because, besides the Coagulations of the Blood, they argue its Mortifications and Corruptions, as in a gangrene or pestilent Carbuncle: If when the *Small-Pox* are come forth they presently wither, and the swelling of the Parts remits, it indicates the recess of the Malignant Matter, or of the Blood congealed with the Venom and its Restagnation in the internal Parts; whence unless upon raising a free *Diaphoresis* it be again driven out, a sudden Death for the most part follows.

As to what concerns the Cure since the course of this Disease has three *Stadia* like so many Stages as it were distinct from each other; the curative Intentions ought also to be accommodated to each of these; wherefore the Therapeutick Method concerning the *Small-Pox* teaches first what is to be done, as long as the Blood boils inwardly, and ferments by the Motion of the fermentative Matter, and the *Small-Pox* do not yet appear; which Period for the most part is wont to be ended in four or five Days. Secondly, What form of Diet and Physick ought to be order'd, from the time of the

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Eruption of the *Small-Pox* to the height of the Disease, to wit, till the *Pustules* are come to their height, and being fully suppurated begin to wither. Thirdly and Lastly, what we ought to observe in the Declination of the Disease, till the *Small-Pox* being dry'd fall off.

As to the first, the Intention must be; that we remove all impediments of Nature, whereby the Blood being defiled with the ferment of the *Small-Pox*, and apt to be coagulated, may retain still its even Motion in the Heart and Vessels, without Stagnation, and that fermenting it may expel forth the Portions coagulated with the Venom; mean while a caution must be had, that the work of Fermentation or Effervescence, be neither any ways check'd, nor too much irritated; for by this the Mass of Blood is forced into to coagulated Portions more than it ought, and by the other it is restrain'd too much in Motion, nor are the venomous Particles sent away forth with the congeal'd Blood. Nature is wont to be hindered from the Secretion and Expulsion, by a too great heap of Excrements in the *Viscera*, by an overabounding of Blood in the Vessels; wherefore presently, at the first Invasion of the Disease, we must endeavour that an Evacuation by Vomit or Siege if need be seasonably procured: We must use only mild and gentle Medicines, that is which do not irritate or trouble the Tumour; wherefore at this time sometimes, Emeticks, Purges or Clysters, these one while, another while those bear Place; opening a Vein also, if there be a plenitude is used with good Success. During the effervescence of the Blood, let a thin and moderate cooling Diet be order'd, to wit, of Oat and Barley Meals, Marigold, Sages, and common Posset-drinks, with those made of Harts-horn and Scorzonera Roots: Or Boil Cochine, and a little *Lapis Prunelle* in Water, with Roots of Contrayerva, Galingal, *Anula Campana*, together with the Leaves of Elm, Scabious, or Marigold Flowers, sweeten moderately, and give this as a Drink to be used during the whole Distemper; if occasion be a little Sack and Saffron may be added to this Apozem, which will temper the Blood, and keep the Body in a state of Perspiration.

When the *Small-Pox* begin to appear, there are three things which ought to be constantly order'd all Sick Persons; to wit, that a mild and gentle *Diaphoresis* be always continued in the Mass of Blood; also that the Throat and Eyes be preserved from the too great Eruption, that the Blood gently boiling may push forth the Disease: For this purpose make a Decoction of Figs, Marigold and Columbine Flowers, with Shavings of Harts-horn, Ivory and Scorzonera Root, to which upon occasion may be added a little Saffron or Cochine; also we give moderate Cordials frequently in a Day, with *Gascogn's Powder*, Crab's Claws Simple, Crabs-eyes, Pearl, Coral, &c. let the hot strong spirituous Cordials be avoided, as also bleeding or any Evacuation in the Irruption, lest the Motion of Nature be inverted in its own Course. For a guard to the Throat, apply a Wollen or Flannel Cloth, and if there be occasion dip it in a Decoction of Salt of Nitre or Prunelle, or use Gargarisms of Plantane Water, Pomgranate Peell, Syrup of Mulberries and *Lapis Prunelle*, which may repel the *Small-Pox* in those Parts. We fortifie the Eyes, with *Epithemes* of Rose Water, Breast-Milk and Saffron, or a little Sugar of Lead dissolv'd in Plantane Water, with some Sugarcandy. Against the more violent Symptoms, as Watchings, Frenzy, Vomiting, Loozness, &c. There is required very great Skill and Experience, as well as Care and Circumspection, both in the Physician and Attendants.

When the Disease is in its Declination, and the *Small-Pox* begin to wither away, and grow Hard, the case for the most part is out of danger, nor has a Physician much to do: Let the Patient though growing very hungry, still be content with a thin Diet without Flesh Meats: If the *Pox* are slow in falling off we are us'd to hasten their Fall, with Liniments and *Epithemes*, as Oil of sweet Almonds, white Lillies, *Sperma Ceti*, Camphore, with Bean Flower Water, *Solomons Seal*, white Lillies, Snails, &c. by which means they are prevented from pitting much. After the *Small-Pox* is fallen off from the Face, Purge the Patient gently two or three times before he goes abroad, and afterward

he may be admitted to a freer Diet as usual.

The *Measles* are so allied to the *Small-Pox* that amongst most Authors, they have not deserved to be treated of separately; but the effects of both are delivered after the like manner and method together. The Essence and Cure differ no otherways but as to more or less, or at leastwise accidentally; because in the *Measles* the *Pustles* are not so much raised in Height, nor are they suppurated. Wherefore the Disease ends sooner and with less danger; This is wont most frequently to reign amongst Children, but seldom seizes such as are grown in Years, or old People: Also those who have had the *Small Pox* before, are not afterwards so subject to the *Measles*, but in most they are allied Indispositions; to wit, the Taint contracted from the Womb disposes Men alone, all Mankind, and that but once to the *Measles*: A Malignant Constitution of the Air, and sometimes Surfeiting, but most commonly Contagion, are wont to draw into act the latent Disposition. Here are marks of Malignity, and the Disease often becomes Epidemical with a Mortality and Contagion.

To give you the thing in short, it seems that the *Measles* are a certain light efflorescence of an extraneous Ferment, contracted from the Womb; whereby some Particles being stirred to Motion, cause the Blood gently and to be a little Coagulated; wherefore the Pimples thence brought forth are blown off by Evaporation, without a breaking of the Skin. But the *Small Pox* are a more full and strong Agitation of the same Ferment, and in all its Particles, which causing a greater Ebullition and Coagulation of the blood, produces a great many more *Pustles*, and those larger in Size or Bulk, and not dissolveable without Suppuration. When the *Small Pox* precede, there follows not only an immunity afterwards from the same Distemper; but for the most part from the *Measles* also: These last, because they consume only a few Particles of the Ferment leave still a Disposition to the *Small Pox*: Wherefore old Persons or such as are grown in Years, are not so readily infected with the *Measles*, because having been before infected with the *Small Pox*, they are freed from the Contagion; or their Spirits being Robust, easily resist the light Miasm of this Affection.

*Of Fevers Acute or Continual, and Intermittent; with
an Account of the Cortex and other Specificks:
From Dr. Paxton, Michael Torris, &c.*

AS there are but two ways of discovering the Condition or Alterations of the Blood; I shall here shew the Diseases that are seated therein; which may be distinguished into two sorts, viz. *Acute* and *Chronick*: By the first of which I understand, such as are sudden and violent, by the second, such as are *Slow and Languid*: The first are usually but of short Continuance, the other more Tedious; the first may be again divided into Continual and Intermittent.

An acute Disease in the Blood, is some sudden and violent change in it, immediately perceived by some alteration in its Motions, which are usually accompanied with some changes in the Separation, and is as I apprehend, what is commonly and in the general signified by the word *Fever*: It is true this is often discern'd by Heat, or a quick Pulse, or both: However, the Term *Fever* in the modern Sense of the word is not strictly confin'd to either. A *Chronick* Disease in the Blood is only a slow change there,

there, that gradually rises from almost unperceived beginnings, and is discover'd by the same Methods; and is what ordinarily I suppose call'd another habit of Body, or scorbutical State, or by some other indefinite Term.

For in either of these States, if the Blood makes any unnatural Separation, by which means some formidable Symptom is produc'd, it matters not whether to the advantage or not of the Patient; it has been honour'd with a particular Name, and then of Course treated as an intire Disease, as I shall shew hereafter. Whosoever will be pleased without prejudice to consider the word *Fever*, in its general ordinary and modern Use, that is, in its full latitude, will find that there can be nothing more intended by it, if indeed any thing certain and real, than some sudden and unknown change in the Blood, by which the diseased is Affected, either with Sickness, Pain, Uneasiness, loss of Strength, and such like: And which can be discovered to us but by some of the above recited ways. It is true the original and genuine import of the Word, seems to carry a more determinate Sense, for if the English word *Fever*, is taken to answer to the Latin *Fabris*, and the Greek *Περεϊς*, then it seems properly to imply Heat, and then in that consists its Essence. But if we observe the Writings of some Moderns, we shall find they will not admit of Heat, but a quick Pulse to be the Pathognomonick Sign, and some again neither. But my purpose not being to examine Authorities, but to follow Truth, not to concern my self about the uncertain use of Words, but to apply my self to things, it is certain the Word *Fever* is sometimes used, where there is no unusual Heat, and it is as certain, it is used where there is no uncommon quick Pulse. Neither is it always used when there is the one or the other. If then it be asked in what it consists, or how it is to be known? It may be answered, in neither separately nor in any one single Symptom, but in a Blunder or Collection of several, that arising suddenly and co-existing are expressed by that single Word, and so are consider'd, as making one Disease. But whensoever the Blood appears under any sudden Disorder, and the Body thereby Dis-

ease'd, that Indisposition is ordinarily call'd a Fever.

The different description of this Disease, the divers and even opposite Methods recommended for its Cure, abundantly shew the uncertainty of its Nature, there being almost as many Opinions as Authors; for the Term *Fever* seems to be as loosely applied in all sudden and violent alterations in the Blood, as the word *Scurvy* in slow ones. As to our second Division into continual Inter-mittent, the words so exactly answering the Alterations, they need no Explanation.

But before I more particularly descend to treat of such things as are usually observ'd to be the Effects of sudden and violent Changes in our Blood, it may not be altogether improper to touch at Causes, by reason it hath been a prevailing Opinion among a great many Learned Men, That neither the Nature of Diseases are to be discover'd, nor Methods safely instituted for their Cure, unless their Causes can first be Traced. That there is a Pleasure in Knowledge I no way doubt; but to pretend to a knowledge in things that are not capable of being known, is to betray our Ignorance; to search after Causes, is to pursue our Shadows, which we can neither overtake nor use; for we are neither capable of perceiving from whence they come, how they are receiv'd, or in what time or part they enter: These poisonous and deadly Agents (that in all probability swim in the Air, because such Diseases are propagated by Contagion) and produce Pestilential and Malignant Diseases, (at periodical Times in some Countries) are not distinguish'd from the Air they move in; neither is the Venom felt in our Veins, nor their Poison discern'd in its Operation.

Besides, supposing our Faculties were so elegantly Nice, that we are able to distinguish those subtle Messengers of Diseases; I do not see what Advantage could be obtain'd by that Knowledge; because no sooner are these fatal Ministers receiv'd into our Blood, but they are immediately diffus'd through the whole Mass, and of necessity so blended and mingled with the other *Parts*, that they are neither to be distinguish'd nor separated: For now being whirl'd about in Circulation, and passing through

through all the small and Meandring Vessels, they undergo a multitude of Vicissitudes, and so really become a part of the Blood, until they are again separated from it, which is not the work of Humane Skill, but of Nature; for it is plain, we are not with all our Art able to separate any one Substance from the Blood, that is actually mingled with it: And if this cannot be effected in such things as we do know, how vain is it to expect it in things we do not know? To discover the Truth of this, we need but examine those Substances that are discharged from us, which bear no manner of resemblance to what we Eat and Drink; nay although the Blood is made out of dissimilar Substances, yet so long as it runs in our Veins, our Senses discover no difference in the Parts of this scarlet Liqueur. For whatsoever enters our Veins to be mix'd with, and converted into Blood, being first prepar'd by our Organs, by which it is so divided and alter'd, that the former Qualities are destroy'd, and new ones arise; and by this means although the Substances we Eat and Drink, often appear in their Qualities so very unlike, yet such are promiscuously converted into the same crimson Gore; the new Qualities by which they become Blood, being imparted to them by the several Alterations that are made by the Organs thro' which they pass: It is from this reason, the Blood bears no resemblance to the Substances out of which it is made; because the former Qualities of such Substances being destroy'd by our Organs, the new ones that succeed bear a likeness to each other, as being given by the same Instruments. It is from the same reason, that those Qualities that Men usually survey in emitted Blood, *viz. Colour and Consistency*, are not observ'd to be, according to what Men Eat and Drink, but according to the Nature of the Organs by which it is prepar'd; the Blood of the voluptuous Beau not being to be distinguish'd from that of the wretched Peasant, supposing their Health to be the same.

It is true, there are several Substances that notwithstanding they are prepar'd by our Organs, and converted into Blood, yet retain such poisonous Powers, as to be destructive to our Beings: But these direful Effects do not seem to proceed from any sen-

sible Qualities of such Substances; but from some peculiar Figure of the minute Parts, which Figure not being alter'd by our Organs (for our Organs only divide and reduce Substances into their minute Parts, by which the sensible Qualities, as depending on their Textures are alter'd, but the Parts themselves may retain their Figures) the noxious Powers flowing from such Shapes may remain: And yet these thus unalter'd Particles, receiving from our Organs new Positions, new Determinations, new Habitudes and Relations, contribute to the producing such Qualities as intitle a Substance to be call'd Blood; for that the Qualities that appear in Blood, proceed from the positions and relations of the Parts, seems evident, in that they may be so easily alter'd in Phlebotomy; for but streighten or enlarge an Orifice, or but change the manner of its Stream, and you alter the Colour and Consistency of the Blood that flows.

Furthermore, The Blood when Diseas'd, is so deprav'd, as to remain unable to perform the regular Offices, by which the whole Body suffers: To remove the Disease, the Blood must be so restor'd, that the Functions may be Executed. To do this such Substances must be administred, that are known to have a Power to restore the Blood to such a State; and to judge what Medicines are fit for this Use, we must inform our selves of the State of the Blood, by such ways as we are capable of knowing; which are only by the Motions and Separations, (as hath been already demonstrated) neither of which (as is manifest from what hath been observ'd) can lead us into any knowledge of Causes, or if they did, such a Knowledge could give us little assistance in the Cure of Diseases, although it might perhaps some in avoiding them. These things being so, methinks we trifle away time to little purpose, in the pursuit of Causes we can never know; or if we did know, could be of any use to what we intend them.

But to return, sudden Changes or Commotions in the Blood, which I shall now call Fevers, may be consider'd under two Heads. In the one of which the Motions may be observ'd violent, and the Separations lessen'd. In the other the Motions appear alter'd, the Pulse being perhaps quick-

er, but not stronger, and the Separation rather encreas'd; or although perhaps lessen'd in one part, yet encreas'd in another. In the first, the Crasis or Mixture of the Blood seems too strict and close; the Parts being kept together by the violence and impetuosity of the Circulation. In the other they are too loose, being too apt to part and divide, as not being mov'd forward fast enough. In the first the Blood is by the too violent and strong Pulsations of the Heart, too rapidly whirl'd about the Body; by which means the Parts are so confounded, jumbled, and so entirely mingled, that they cannot break or part from each other, and the Vessels become turgid and full, so that there is neither time nor space for leisurely Separations. And the Blood thus furiously drove about in Circulation, the Parts heat, expand, and sometimes extravasate or burst out of their proper Vessels; or being by some means stop'd or hindered, in its crowding through the small, narrow and *meandering* Passages, or by the Formation or Situation of some Parts, or by some other unknown Cause, not so readily passing in some Places, as in others, it creates and raises Pains, Inflammations, Soreness, and sometimes Tumours; any of which when observ'd formidable or dangerous, become then honour'd with particular Names, and are treated as entire and particular Diseases; and such Diseases, which is very remarkable, are for the most part denominated from the Part then affected, or from the manner of affecting; hence the Diseases, *Pleuritis, Peripneumonia, Rheumatismus, &c.* and sometimes such are in the general term'd only Inflammations; or if it burst out of its Vessels in Bleeding, Hemorrhages. In the second sort the Pulse is rather quick and weak than strong, the Vessels not Turgid, by which it seems as if the Heart did not receive or throw out the Blood in proportionable Quantity, so that the circulatory Motion appears but slow, that always being as the pulsations of the Heart are. The Crasis of the Blood seems somewhat loose, there being time and space for its Parts to break and divide, some of which stopping will become Obstacles to it, in its progressive Motion; hence therefore it must circulate unequally, because being contain'd in that

Motion by an impulse from the consistent Parts, it must run in greatest quantity where it meets with least Resistance; hence the Secretory Vessels or Parts fitted for Separations, being unequally supply'd, must separate unequally; so that if Separations are diminish'd in one Part, they will be usually enlarg'd in another. Thus may we often observe Sweats perhaps by Parts, as only upon the Head, Face or upper Parts, and sometimes profusive ones over the whole Body, Vomitings, Loosnesses, sometimes although more rarely, disproportionate Quantities of Urine, which perhaps might be more frequent, were Men not obliged by Weakness or Command to a Bed, and sometimes Salivation: In some the very constituent Parts, so break and divide as to stagnate near the Surface, and to create various Discolourations and Spots, but the Circulation not being forcible enough, do not rise into Tumours, or create Inflammations; and sometimes the thinner Parts will be spew'd slowly out of some of the Capillaries.

The word *Fever* is promiscuously us'd, as is most manifest from the Symptoms to denote two different States of Blood. In the one of which the Blood moves too rapidly in Circulation, by which means the Parts are so confounded, that the Separations are for the most part lessen'd.

In the other the Circulation is so Languid, that the Parts become apt to divide and part from each other, by which means the Separations encrease.

In the first Case, the return of the Separations is the Cure of the Disease; and so are call'd Critical. In the last Separations give no advantage, and so are term'd Symptomatical.

I would not be thought so vain as if I imagin'd, that all sudden Commotions of the Blood, which are compris'd under the Term *Fever*, could be always observ'd nicely to quadrate with what I have here but in the general hinted; for although their appearances may be consider'd under the Heads I have plac'd them, yet it must be no wonder if they do not always continue in their whole course the same; for their beginnings, progress, height or declination, will be sometimes very Differing, both in their

Motions.

Motions and Separations. Besides, the frequent Remissions make marvellous Alterations to the Observer, by reason the variation in the Motions is immediately perceiv'd, but that in the separated Juices cannot; because they may remain some time in the Body after they are Secern'd, before they are Excreted. However, it is sufficient to my Purpose, that we are indebted to these for all the knowledge we have of such Commotions, there being nothing else that can appear to direct us in it.

The Sum then of what I have said is, That Diseases in Humane Bodies are Changes in them; and that all such proceed from the Fluids, that is, the moving Particles; and not the consistent Parts, that is, from such as are United: That if they are Affected, *viz.* the consistent Parts, as sometimes they are, it is by the means of the Fluids, (excepting where they are injur'd by some external Violence.) That in our Bodies may be observ'd variety of Fluids, of which two are common, the other proper to particular Parts. Of the common, one is primary, being the source from whence all the others, as well common as proper, are separated. That the primary common Fluid is what we call the Blood, which is made up and compounded of very differing and unlike Parts. That this Blood enjoys two Motions; the one of which is natural to it as it is a Fluid, being only the intestine Agitation of its minute Parts: The other is its Circulatory, Animal, or progressive Motion, which is proper to Life. That by the first of these it is in its natural and healthful State, disposed to separate and part from its disagreeable, useless and unnecessary Parts; that is, the Homogenous Congregate, and by that thrust out and separate from the Heterogeneous; but that it is hindred in this Work, by its being impell'd forward in Circulation; however, that it doth send out such Parts by the secretory Vessels, as are requisite to continue it in a State that may be useful for the Body. That these Vessels are only passive in Separation; for being consistent Parts, they naturally remain, in relation to the Body, in the same Place and State. That in Health the Blood is always dispos'd to let go such Parts, as

are necessary to form such appropriate Juices as these Vessels are prepar'd to separate; and the Blood always circulating, these Vessels will be supply'd: So that so long as these two Motions are Natural, equal and just, the Separations will be so, and then, so far as we can discover, the Blood is in a state of Health; but when the Natural Concord between these two Motions is interrupted, the Blood swerves from its natural State, and the Separations become alter'd and vitiated. Then it must follow, it must be by these, that the Vices, Faults or Diseases of the Blood, can appear to us no ways, but by these Separations from it, or the Motions of it. And as it is only from these we can discover such, so it is only by these we can be directed in our Methods to Remedy, because, indeed, there is no other ways whereby to do it. That the account had from the Sick, can give us small light into the Nature of such Diseases, because he can only relate what he knows, which, indeed, is nothing of the Blood. That the ordinary way of treating Sickness, under certain Kinds, is uncertain and dangerous, in that the same Symptoms do not regularly co-exist. That it is but frivolous to enquire after Causes, which, if known, could be no help to the curing Diseases.

I. Having already distinguished Diseases, or unnatural Changes in the Blood, into two Sorts or Kinds; first into such as are sudden and violent, and so call'd Acute; and secondly, into such as are slow and languid, and so term'd Chronick. And the former being again sub-divided into continual and intermittent; and having briefly treated of the Continued, it remains upon me, according to my proposed Method, to speak something of the Intermittents. In which the Blood does not, as we are plainly taught by the Symptoms, continue in a settled, disorder'd State, but shifts and changes; sometimes we may observe it all in a Hurry, which is what we call the Fit, which gradually wears off, and then it is for a time more quiet, Calm and Natural, and then again it falls into a Disorder; and thus these will interchangeably return at such certain and periodical Times,

as their returns may easily be fore-known, if by some irregularities they are not disturbed or alter'd.

II. I have already intimated, that there is no one known Remedy (nor perhaps, if we rightly consider the natural State of the Blood, never can be) that will certainly, safely and effectually Cure, suppress or extinguish a sudden Disorder or Commotion, actually begun in the Blood. Because such Disorders being occasion'd by the Accession of some disagreeable Matter into the Mass, cannot naturally Cease, until that Matter is again separated and parted, (which as hath been prov'd, is the proper work of the Blood it self;) for notwithstanding the Blood may be disposed to Separation by medicinal Helps; yet whether such Separations will be of any Advantage, depends upon the Disposition of the Blood to throw off the peccant Parts: For Diseases, or Disorders in the Blood, are only a sort of Strife or Collision between the Parts; in which Conflict, if the Parts that are Friendly, Homogeneous, and agreeable to our Natures, prevail so far, as to expel and drive out the others, the Disease ends happily; but if such as are Enemies to our Nature are too powerful, the Consequence is Fatal.

Whensoever therefore the Blood is continually supplied with new Matter, to support or continue these Disorders; it is manifest such are not to be suppressed, until what thus occasions them can be remov'd; because although such naturally end upon the Expulsion of what occasion'd them; yet being by the addition of new Matter Renew'd, they continually Repeat. But if the Blood shifts and changes its State, falling only into Commotions at certain periodical Times, which often appear in very different and sometimes surprising Symptoms; which notwithstanding in such a determinate Time gradually go off and Vanish; and then again at such intervals regularly return and repeat, be the distance of time, one or two Days, or be it only some Hours, between these Fits. In this case we have a Remedy, if methodically administred, that will certainly, regularly and effectually retain the Blood in its natural State; and thereby prevent its falling into

these periodical Disorders. The Medicine I here intend is the *Peruvian Bark*; a Drug, become of an almost universal use by some, and honoured with so noble a Character, as to be thought the only known Specifick: But notwithstanding by its certain and marvellous Effects, it justly deserves our highest Praise, yet I cannot be so uncharitably unjust to all other Medicines, as to allow it that Prerogative; by reason, I think, if we do not too much narrow our Views, we may observe some other Drugs to be as certain and regular in their Effects, if but applied with Caution and Judgment. But that I may avoid mistakes that may arise by the uncertain use of Words, I shall beg leave to explain in what Sense I here take the Term Specifick. But to do this so that it may the better suit to my Discourse, I must briefly repeat what I have already said, viz. That all Medicines may be rank'd under two Heads, either such as Evacuate, or such as only Alter: That by the first somewhat is discharged the Body, so that quantity is lost; by the second only some Property, Power or Action is changed; and so only some Quality is altered. By Specificks then I only understand, an Alterative Medicine that Experience teaches us will certainly, regularly and effectually cure such a Symptom, or Symptoms, as are usually taken to constitute such a Species of Disease, by only altering such Properties that make it, without any Evacuation. And herein I take to consist the difference in the sense of the words Alterative and Specifick: the former is to be taken in a more loose and general, the other in a narrower and more special Sense: The first may indifferently be used for all Medicines that will, by a continu'd use, some ways alter or change the Juices, but of whose Effects, we are not always certain; the latter may be taken for such an one, as hath been experienc'd effectually to remedy such a Disease, and so Men have a little doubt of its Success. And although Evacuations sometimes ensue upon their use, yet such, by reason of their uncertainty, seem not to be of their genuine and natural Effects; but only Accidental, not from the Operation of the Medicine, but from the Alterations in the Juices made by it; which now by the Virtue of that be-

ing again changed, come to make their usual Separations, which therefore may at first run off plentifully this or that way.

III. This being premised, the Cortex cannot, as I think, justly enjoy the Character of being the only Specifick; by reason we have other Medicines that are Alteratives, that may be experienced as certain in their Effects, if but as properly applied, as I shall have occasion to shew hereafter. And what hath mounted the so celebrated Cortex to such a height of Reputation beyond other Drugs, seems to me to consist in these Things.

First, In that its genuine and certain Virtues in the curing Intermitting Fevers, became as early known here in *Europe*, as the Drug it self; for it was that which first brought it hither; so that Men, from its Use here, being assur'd of its Excellency, entirely depended upon it; and therefore have not so maimed it by Preparations, as is usually done by other Drugs; but have kept it to its native Purity, whereby it's certain Effects are better discover'd, and more confirmed.

Secondly, In that its proper Use is in such Diseases as are easily observed, and may be readily distinguished and so are better known; hence it is duly and properly administered, and not so often misapplied, as most other Medicines are. And indeed this Advantage the *Bark* has above all other Specificks, that it is not often improperly given; for it's true, Use being in such a State of Blood, where there are Intermisions, or at least Remissions, which become so easily to be observed, that Men cannot without very great Inadvertency Err: For whose Observations can be so unwary, or Understanding so dull, unless Men will willfully shut their own Eyes, but may discern when there is a Fit or not; that is, but may plainly see that the Diseased is not always alike. And where that is (I speak of Diseases in the Blood) that this noble Drug is a safe and sovereign Remedy, without any regard what the Symptoms are: As I have abundantly experienc'd.

Thirdly, In that the Symptoms that usually accompany these Intermisions or Remissions that are cured by the Cortex, are

usually in their Seisures surprising and sudden, in their continuance Violent, and in their events Dangerous; hence this Drug that thus puts a stop to them, comes to be more Celebrated; whereas in the Use of other Alterative or Specifick Medicines it happens directly otherwise; for their Virtues were not so early known as the Things themselves; but have been gradually discover'd, and for the Reasons formerly urged have been differently represented, so that their certain and regular Effects are not well Established; for altho' a long and continued Use hath advanced an Opinion of the great Excellency of some of them, yet such hath been the Custom, Usage or Fashion of so confounding them in Compositions, or so defacing them in Preparations, or administering them so uncertainly, that their native Virtues either have not been discovered or well distinguish'd.

Besides these Disadvantages, their Efficacies have been clouded by other Difficulties; in that they have the Misfortune to be esteem'd Specificks in Diseases, where the Diagnosticks have been but imperfectly established; by which they are sometimes administered in very differing States of Blood; and therefore cannot produce the same happy Effects: From all which Considerations it is manifest, that notwithstanding other *Specificks* are as Efficacious in their Operations, as the celebrated Cortex; yet their Characters cannot shine in the same Lustre.

IV. The renowned Cortex seems to me regularly and certainly to produce but one constant and single Effect, which is the preserving, keeping or retaining the Blood in one certain and unaltered State; when it is disposed to shift and change by Intervals, and by this means all those terrible Symptoms, that appear in the *Fever Fit*, and which would have been formed in such a Period of Time, are prevented; for the Symptoms that appear in the Fit, arising from the Commotion of the Blood, the Commotion being hindered, the Symptoms cannot appear; for it is manifest the curing the Symptoms is but an accidental Benefit arising from the Use of the Cortex, because no one Symptom that appears in the Fit of an Intermitting Fever, is cured by this Drug, when it

Exits.

Exists independently of such Intermiſſions. Thus neither that Horreur or Rigour that ſometimes may be obſerved in the Beginnings, nor that Sickneſs, Loathings, Reachings or Vomiting in it; nor thoſe Pains, Inquietudes, Uneaſineſſes, Deliriums, Phrenſies, Coma's, Convulſions, or ſo forth, that do ſometimes accompany it; nor that Heat, Thirſt, Burnings that are ſo common to it; nor that Sweating after it; neither one or more of theſe will ever be regularly and certainly remedied by the Cortex, but when they accompany ſuch Intermiſſions. And on the contrary, Intermiſſions will be cured by it, although they are not attended with theſe uſual Symptoms.

V. Alteratives taken in a more general, and Specificks in a more ſpecial Senſe; for ſuch Medicines that cure Diſeaſes without Evacuation, it will be clear that their Effects or Operations muſt be bounded to one of the common Fluids, viz. Either Blood or Spirits, and cannot immediately reach to any of the appropriate Juices; by reaſon ſuch Juices are only Separations of ſuch parts of the Blood as will paſs the *Secretory Veſſels*; and ſuch parts having paſſed them, may be diſcharged; but cannot be altered but by the Blood, from whence alone they are derived, whereas the Spirits, altho' ſeparated from the ſame Blood, yet being the Inſtruments in Senſation, and of all Organical Motion, may and are immediately operated upon, not only by external Objects in Acts of Senſation; but alſo by Medicine it ſelf, as is particularly evident by the Uſe of *Volatile Salts*, *Fetid Smells*, and ſuch like, in *Fainting-Fits*, and what we call *Hysterical Caſes*, which being but applied to the Noſtrils do preſently betray their Effects upon the *Spirits*, by the haſty Change that is often perceived by the Diſeaſed; but of this and the Reaſons more largely in the next Chapter.

VI. The noble and almoſt infallible Virtues of the renowned Cortex, ſolely depends (as I apprehend all other Medicines do) upon its true Uſe and timely Adminiſtration: For altho' it is properly beſitted to cure periodical Diſorders in the Blood; yet it will not always perform this, for whenſoe-

ver intermitting Commotions in the Blood, are excited from ſome Cauſe, without the Blood, the Cortex is but an ineffectual Remedy, as hath been often experienced by its ſucceſſful Uſe in *Heſtick Fevers*, which although uſually occaſion'd by ſome putrid Matter contain'd in the Lungs, yet frequently appear more violent at one time than other. The ſame may be obſerved concerning Diſorders that ſeem to be originally derived from the *Spirits*, for the circulatory Motion of the *Blood* depending upon the Vibration of the Heart, and the Heart being moved by the *Spirits*, the Motion of the *Blood* will be altered and diſturbed by the *Spirits*; and theſe ſometimes falling into periodical Diſorders, the Motions of the *Blood* become perplexed: This Commotion, altho' Periodical, not being began by the *Blood*, will not be removed by the Bark.

By all which it appears, that the Efficacies of this ſo much renowned Drug, does not conſiſt in any Specifick Virtue of curing this or that Diſeaſe, or this or that Symptom, but only in detaining the *Blood*, from falling into Diſorders: And that no Virtues are derived from it, unleſs it is rightly applied; and therefore is endowed with no more Efficacies than other Subſtances, ſince the ſame may be affirmed of divers other Medicines; for the Effects of *Opium* are as certain, that of ſome *Volatile Salts*, *Caſtorium* or *Fetid Gums* as ſudden, ſome *Aſtringents* as regular, Steel as conſtant, and ſuch like. It is true, theſe and ſeveral others are often in effectually adminiſtered, for Reaſons already urged; but yet notwithstanding theſe Difficulties may be overcome, if we will but apply our ſelves to proper Methods; and how far too much Precipitancy, by an overhaſty deſire to do preſent Service, may be a Bar to it, I only offer as a thing not unworthy to be conſider'd; for, perhaps, by too eager a Zeal of doing good, we may launch out into an Ocean of Uncertainty, before we have Needle or Star ſafely to guide us; whereas, ſometimes, by a little Delay, Nature plainly ſhews which way the is to be reliev'd.

VII. This farther is very remarkable in this moſt excellent Drug, that it is always beſt in its pure and natural Dreſs, never as

far as I could discover, bettered in its admirable Virtues, by any pompous Additions, or specious Compositions, but sometimes hindred by them; never mended by any elaborate Preparation or Chymical Process, but often robbed and spoiled by such; for as it seems not very likely that its secret and peculiar Excellencies should be strengthened by the pompous Addition of different Substances; so neither does it seem probable that its specifick Efficacies, which must necessarily flow from some peculiar Texture or Configuration of its minute Part, should be bettered or improved by Chymical Processes, which must alter its Texture, and change its internal Constitution. For if all the Powers and Qualities of Substances arise from the internal Constitution of their minute Parts, as reason Demonstrates, and fact Proves, then it is manifest, by altering or destroying the Texture, from whence the Powers proceed, the Powers themselves must be altered.

And that the chymically analysing Substances does this, is apparent, in that the Parts into which it is by this Art resolved, bear no resemblance to the whole; for as the alteration of the Texture of a Substance brings a manifest change in the Qualities; so a change in the Qualities prove an alteration in the Texture. For if Substances differ from one another only in the Size, Figure, Motion, or Rest, Order, and Position of their minute Parts; and their Powers and sensible Qualities proceed from them; then it is plain if the first are altered, the second must be changed. And that this, in Fact, is so, clearly appears by chymical Preparations, where the Original or Native Qualities or Powers of such particular Bodies, as are thus analysed, are often changed and lost, and new ones thereby acquired, extremely differing from the former; as may be most notoriously experienced in most of the elaborate Preparations, whether made upon the Subjects belonging to the Animal, Vegetable or Mineral Kingdom; in many, if not in most of which, the sensible Qualities are not only altered by the Preparation, but also the Powers, Effects, or Operations which they would have had upon our Bodies, as Medicines are also changed; some Things by these proceedings, be-

coming, perhaps, violent Emeticks or Catharticks, that were in their Natures neither; or perhaps are changed from being such, to Diaphoreticks, Alteratives, or Cardiacks; I need not produce Instances, the thing being so well known. And this consideration enclines me to think, that no real Specifick can well be bettered in any of its native and genuine Virtues, by any elaborate Preparation; by reason such Virtues depending upon some peculiar Modification of Parts, which, by dilacerating and dividing the Texture of the Substance, in order to resolve it, into what the Chymists call their Principles, must necessarily be changed: For although the *Spagyrist*s furnish us with many excellent Medicines, yet the Virtues, Powers, Qualities and Faculties of such, are so widely different from what were in the Substances, out of which they are produced; that they seem rather to be derived from the Fire, or Forms and Method of Preparation, than to have been pre-existent in such Bodies. For there appears, in a multitude of chymical Preparations, no more remains of the native Properties of the Substance; than there does in Vegetables of the Earth and Water, out of what they are nourished.

But notwithstanding this mutability in Qualities, and the very relation they bear to our Senses; yet such hath been the power of Hypotheses, that Men have renounced the Evidence of their own Faculties, (which every moment gives them Instances of their Fallacy) to subjugate their Understandings to them: For upon the late broaching an Hypothesis of *Acids and Salts*, Men have immediately consented, that not only Diseases in humane Bodies, but also the Powers and medicinal Faculties of all Substances, were to be derived from that duumvirate. And this, notwithstanding their daily Experience does give them a full Testimony, that the Powers of Substances are not to be known or distinguished, by such transitory Proofs as sensible Qualities; there being no one Quality that entitles all Substances that partake of it, to the same Uses; for some Substances that are in Taste Bitter, are Emeticks, whilst others of equal Bitterness are either *Catharticks*, *Hystericks*, *Stomachicks*, &c. and the same may be experienced of all other

other Qualities relating to any other Sense, viz. either to Colour, Smell, or Touch.

It is for this Reason, that I have often wondered that divers learned and ingenious Men should warmly contend about a Doctrine established upon so precarious Principles, as that must be, that derives all alterations in Nature from sensible Qualities, (and so they do who build an Hypothesis upon *Salts and Acids*) which are apparently alterable. However the Contrivers or Defeaters of this Doctrine have more particularly narrowed it to Diseases; in the explaining of which they very much differ; for the Champions for *Salts* ignominiously reproach *Acids*, as the Cause of all the Miseries that disquiet the Healths of Men; whilst the Defenders of *Acids* do load *Alcalies* with the same Ignominy: And yet, which seems wonderful, neither of these Gentlemen have, as-yet, proved the real Existency of either of these Principles in the Blood, which they accuse of being corrupted in Diseases. For, notwithstanding it fully appears by the Taste, that such Qualities sometimes reside in the *Secreted Juices*, yet that is no Proof, that such were formerly pre-existent in the Blood; unless it was first proved, that sensible Qualities were unalterable, or that these were really so; for otherwise such Qualities may be acquired by the Secretion. And it appears pretty Evident in Fact, that they are so obtained, by reason the Taste, the Colour, the Smell, the Consistence of the several secreted Juices, are so extremely unlike the Blood. And if such Qualities that are thus believed to be the Causes of Diseases, only reside in the secreted Juices; then are they never to be corrected by Medicines (although they may be evacuated) unless they are contained in the Stomach, for Reasons already assigned.

Besides, how trifling it is to pretend to explain the Phœnomena of Diseases, by sensible Qualities that really have no Being out of our Minds; for remove but our Organs, our sensible Qualities Vanish; the Substance in which they are suppos'd to reside, containing nothing beyond the Size, Figure, Position, Motion, or rest of its Parts? And surely thus to explain the Nature of Things by our Perceptions, is, in it self, Preposterous. But if Men will con-

tinue to narrow their Reasonings for a dear Hypothesis-sake, why should not the Qualities appertaining to other Senses be equally admitted into the Causes of Changes in us, as well as those of the Taste? Why I should conclude, I know the Operations of a particular Substance, either upon my own or another Body, better by my Sense of Tasting, than by that of Seeing, Feeling, or Smelling; or why I should know the Effects of a Body better upon me, because it affects my Palate thus or thus, than it does because it affects my Eyes, my Nose, my Hands, since my Mind equally perceives Bodies operating upon either of them: Or if we should admit the Palate here, the proper Instrument to be employed for this end; by reason what passes into our Bodies must go this way, and so to be tasted; and accordingly either to be admitted into us, or excluded; yet why only these two sorts of Tastes, to be thought the causes of Alterations in us, when we abound in so many others. And then why we should be exalted so much in our Opinions of these, as to assign the Causes of our Diseases to the predominancy of one of them; and of consequence its Remedy to consist in the administration of the other, when it is so notorious that the Medicines that are celebrated to be the most powerful in their Operations, do not appear to partake of either of them: For, I believe, the nicest Palate would be puzzled to discover in Native Mercury, Antimony, the Cortex, Opium, and such things, either of them. Besides, the most renowned Patrons of this Doctrine will be ashamed to own that the same Efficacies, Virtues, Effects or Operations upon our own, or other Bodies, will equally flow from all Acids or all Salts: So that by that they admit it is not from the Doctrine in the general, but to Experience only, they owe the Knowledge of their particular Effects. For as to what may be urged from that contrary that is found in the very Natures of Salt and Acids, from that Strife or Ebullition that frequently arises between them when mingled or brought together, and how that they seem to destroy each other; I say, here is nothing uncommon, but happens (altho' not so much regarded) in several other Things: For instance, several Substances

that

that are compounded and made up of very differing sensible Qualities, Ferment and Heat, and rise into Ebullitions, and then alter their sensible Qualities. Nay, do not all Qualities appertaining to other Senses, destroy each other, as is evident in Colours, Smells, and in other Tastes, in all which, by the admixture of two differing ones, a third will arise, unlike to either?

VIII. But asking Pardon for this tedious Digression, it only remains upon me, before I conclude this Section, to speak a word or two of a sort of Medicines that are in frequent Use in acute Diseases of the Blood, and are comprised under the Name of Cordials: And these seem not to be used as contributing to the real Cure of the Disease, but only as a necessary Means during the Disease, to comfort, refresh, and keep up the drooping and oppressed Spirits. It is not my Business to enter into a worthless Enquiry of the Etymology of the Word, and to shew how it refers to the Heart, but shall here take it in what seems to be the modern Acceptation of it, for a Medicine comforting the Spirits. Our Spirits being separated from the Blood, they will in some measure partake of its Nature; as is obvious in Fevers, where the Blood being disordered, the Spirits soon become so too, as appears by the Symptoms that are proper to them. And then as the Spirits may be differently altered, it is clear they may require very differing Medicines to be comforted or refreshed by. And this appears abundantly evident in Hysterical Cases, in which, sometimes, the most offensive Things are then Cordials; that is, the Spirits that are really

refreshed by such Things, that will disorder others. In short, there can be no universal Cordial, but Things will be so as they are applied; which that it may not appear only a bold Assertion, I will further illustrate it by a notorious Instance: Wine and most spirituous and inflammable Liqueurs are generally esteemed Cordials, and are really so to most in Health, in that the Spirits are comforted, cheered and refreshed by them; and yet it is plain there is a Time when they are none; for they are so far from being Cordials to Men, satiated with such Liqueurs, that the more they are taken, the more their Spirits are oppressed, their Understandings Confounded, their Stomach Loathed, and their Strength Destroyed; so that it is clear they are then, to such, no Cordials. And if Cordials are only such things as Refresh and Comfort, it is plain, when we are stifled with Heat, and almost consumed with Flames, such things as encrease and nourish, such Evils can then be no Cordials; and yet few things are esteemed Cordials, but what will do that; and if such Medicines in such Cases must be thought Cordials, I am apprehensive they may be sometimes experienced to be fatal Ones; for most assuredly then the best Cordial is to deliver the Spirits from their Oppression, which is not to be done by adding Fuel to the Fire, that is, by encreasing the Heat; and for this Reason, in Fevers, Small-Beer, Barly-water, or such innocent and inoffensive Liqueurs, will be often found more refreshing than all the pompous Processes, or chargeable Compositions of Pearl-Cordials, or spirituous Juleps.

Of the Venereal Disease; a particular Tract from Musitanus; Of the Gonorrhœa, Mercurials, and Salivation, from Paxton; And of the confirm'd Pox, by Blanchard, Michael Torres, &c. Together with an account of the Venereal Phthisick or Consumption.

I Shall not trouble my Readers to give an account of the Names and Origine of this Disease, or the time in which it was first known in these or any other parts of the World; since they are of no signification either as to the Nature or Cure thereof; but only serve to increase Disputes, and not improve our Understandings: Since therefore such an Undertaking yields no real Satisfaction to the World, I shall at once proceed to shew what the Venereal Distemper is.

The *Lues Venerea* is a disposition against Nature, which is Contagious upon the Touch, being occasion'd by a Poison or *Virus* of the same Nature that arises from an Ulcer in the *Prostata*, produced by the Corruption and Fermentation of the *Semina* of divers Persons received into the Genital parts of both Sexes; upon which one or more of these Accidents do follow, *viz.* Heat of Urine, or a Virulent *Gonorrhœa*, and Running of the Reins, Chancres, Bubo's, or Poulains, Tumours, Boils, Condylomes, Nodes, Glands, Nocturnal Pains, Spots, Blisters, Tettors, Scabs, Ulcers, Rottenness, and a Caries of the Bones, Warts, Wrinkles, Shedding of Hair, and many others which proceed from these, or may be common to this and other Distempers.

Nevertheless some of the first of these Accidents mentioned in the Description, may follow upon other Diseases, but 'tis observable that when they proceed from the *Pox*, they are attended with something that is singular, which discovers them to be the effect

of the *Pox*, as we shall shew when we come to speak of them in particular, or give the Marks, by which we may discern that Distemper from other Diseases. It will appear from what we shall hereafter Assert, that we allow of only one sort of *Pox*, and here we affirm that what is usually call'd a Heat of Urine, a Chancre or Bubo, is not of a different Nature, from that which is known by the Name of the *Grand Pox*, as we shall thus prove. First, because that Heat of Urine does as infallibly turn to the *Grand Pox*; as the *Chancre*, or *Poulain*, upon a Neglect, or ill management of the Cure. Secondly, Because the *Grand Pox*, and the fore-mentioned Accidents admit of the same sort of Cure. However, at least as they are Malignant and Venereal. Thirdly, Because the *Grand Pox* is nothing but a Collection of those Accidents together, as will hereafter plainly appear.

There is therefore no essential difference, betwixt Heat of Urine, Chancres, Bubo's, and the *Grand Pox*, neither as to the Nature of the Malady, nor the Cause whence they proceed, nor finally as, to their Specifick Remedy; there is nevertheless an accidental Difference, which does consist in this, that the *Grand Pox* generally seizes the whole Body, because the Mass of Blood is thereby Infected; upon which account it may be call'd an Universal *Pox*; and Heat of Urine, the Chancre and Bubo attack but one single Part, either for that the Venereal *Virus* has not been carried far, since it was first communicated, or that Nature has expell'd it;

by a vigorous Influence, and as it were by way of an imperfect *Crisis*, as may be seen in Bubo's, or finally, by some other Accidents, and therefore this may be call'd a Particular Pox: In which there is also a notable Difference, as to the manner of using a Specifick Medicince, and some other Circumstances, which are best observed in Practice.

'Tis further Remarkable, that there is another sort of *Particular Pox*; that is to say, which lies in one particular part of the Body: For it often happens in Practice, that after the Universal Pox is cured there still remains a lurking Poison in some part of the Body, as in the *Caries* or *Gangrene* of some Bones, in some Nodes or hard Knots, which admits of no Dissolution, by the action of *Mercury*, when all the rest of the Body is cleans'd; and which consequently requires a particular Remedy: And altho' the *Pox* is the same in all Persons, and at all Times, and has its Specifick Remedy, which is *Mercury*, yet it cannot be well cured, but by Accident, unless the Temper, Age, Sex, and other like Circumstances of the Persons Infected, be duly consider'd; for Men are commonly Stronger, Women more Delicate and Moist; therefore their *Menfes* must direct us in the Choice of our Method when we attempt their Cure.

Those who are of a deep Melancholy Temper are commonly cured with the greatest Difficulty, because their Humours are more Stubborn and Tenacious, and because they abound in Aduft, and frequently Austerity, four Humours which are worse than the other: Cholerick Persons are easily work'd upon, or mov'd to Stool, but suffer cold or heat less than others; wherefore the *Bile* with which they abound, must not be irritated, by a sudden change of those Qualities; those of a Sanguine Constitution must be often Blooded, and Flegmatick People much inur'd to drying Medicines: Infants and old Men, being more tender or feeble ought to be look'd after accordingly; neither the one nor the other ought to be Fluxed, especially if they be very Young on the one Hand, or decrepit on the other.

'Tis further alledg'd, that the Times or

Ages of this Disease are to be distinguish'd, viz. Its Beginning, Increase, State and Declination; but seeing it is not an Acute Disease, and besides those times are not determined equally, and leave not a regular Course, I think it impossible to bring the thing into a true Light: Because for Example, there have been some Persons, who have had the *Pox* for the space of Ten Years, or more, without any remarkable Appearance, or fatal Consequence; and others who in the space of three Months, have become almost Rotten. There are some who upon a *Chancre* neglected, or ill cured, shall be for two or three Years free from the consequent Marks of the Malady, and others who in Six Months time be therewith cover'd all over, the thing depending less or more on the Activity of the Venereal Ferment, with which they are Infected, and on their good or bad Constitution: In a Word, the times of this Disease are so uneven, irregular and uncertain, that there can be no standing Rule given, by the help of which we may discern them, experience being the best guide in this matter.]

Of the Progress of this Disease, and the various degrees thereof; 'tis to be suppos'd that the several ways how one may get it, may be reduced to three; for either the Malady is Original; or it is got by Copulation, or lastly some other external Contract. Secondly, It must be supposed as we shall hereafter prove that the Cause of the *Pox*, is a sharp fermenting *Virus*, or Poison, which without all question is of the nature of a Caustick Acid, upon which account it can Coagulate or check the Humours, with which it is mixed, but especially the Flegm. Thirdly, 'Tis to be consider'd, this Ferment is only so much the more Active, as 'tis the more exalted by a long Corruption, and as it passes from a Body more Warm and Open to another, that is likewise Heated, and contrariwise, that it is the less Active, and consequently works more slowly when such conditions happen Opposite; in these respects the Ferment is rendered more or less fixed or volatiliz'd: This being premised, I shall give a view of its ordinary Progress.

If a Man has the *Pox* he emits into the *Vagina Uteri* of the Woman a *Semen*, that is full of that *Venercal Virus*, which insinuates it self into, or wounds those parts which are naturally disposed to receive it, as being Soft, Spongy, and very full of small Glands, that are almost imperceptible in their natural Figure and Position; though they be at this day pretty well known by Anatomists, and sometimes do so much encrease, that they may be easily discern'd, 'tis those small Glands that readily imbibe the *Venercal Ferment*, which in them is further Corrupted; that is, it becomes more Sharp, by remaining in them, and seeing it has the Nature of an Acid, it fixes and coagulates the Liquors that are contained in those small Glands, whence there arises a hard small Tumour accompanied with Pain, which is that we call a *Chancre*: And because Heat puts that ferment in Motion, which thereby becomes Sharper, there happens a Corrosion of the Substance, and a small Ulcer begins to grow, the Limits whereof remain as yet Hard, and this Ulcer spreads or encreases by little and little; this is what they call a *Chancrous Ulcer*, and a *Particular Pox*, seeing it only affects one Part: Or if one pleases we may take this for the first Degree of the *Pox*, or the first advance that this Venercal Ferment makes. That Ferment always Multiplying, corrupts the ulcerated Parts that are next to it, and especially the Liquors that ferment more easily; hence it is that the Blood that is carried by the Arteries for the Nourishment of the Parts, does receive some Particles of that Ferment, and in returning by the Veins, communicates those Particles to the Mass of Blood which by degrees comes to be sufficiently dispos'd, by the Accession of such Particles for a Fermentation and Corruption; that is to become it self a Venercal Ferment.

Thus we see how an Universal or *Grand Pox* may proceed from a small *Chancre*, that was only at first a *Particular Pox*: And the Mass of Blood may be corrupted a thousand times according to the form of the *Virus*, or the Constitution of the Person: If the Ferment be volatile enough, and the Parts have Bile or Choler predominant in his Constitution, there arises a sort of Turgency,

which makes the Humours Glide, sometimes, on the one Side, and sometimes on the other, from whence wandering Pains proceed. If the Ferment be more fixed, and the Person Melancholy, the Blood likewise becomes fixed, and does Coagulate, and its Motion consequently becomes unequal and slow, which is the Cause of Weariness, want of Appetite, and decay of Animal Spirits, ill Concoction, and ill Nourishment, together with a Depravation of the Excretions; *Suppression of the Menstrua, Hemorrhoids, &c.* If the Ferment be very Acid, and the Person Plegmatick, that ferment entangles it self in the Flegm, which it makes Viscous and Thick, whence the Body comes to be Chill'd, puffed up and Bleak. If the Person be Sanguine, it produces an unequal Heat and Effervescence in the Veins and Arteries, leaves Inquietudes, Watchings, Vapours, &c, every one may by this discern the Consequences of that Corruption of the Mass of Blood, which cannot be described in so small a Tract.

And this is the second Degree of the *Particular Pox*, or if you please the first step to the *Universal Pox*. 'Tis not easie for the Mass of Blood, to remain any long time in this Condition, but discharges it self into all parts of the Body, which it Moistens, and thro' which it passes by a continual Circulation: And such discharges always happen with a great deal of inequality. For it is a constant Maxim, in the admirable Oeconomy of the Body, as 'tis every where else, that the stronger over-powers the weaker; Nature that has a continual Propensity to disburden it self when oppress'd, though it be provided with ordinary Passages, for expelling the Impurities of the Mass of Blood, yet does not always take the same ways, especially when she is struggling with an Adversary that treats her with the greatest Violence.

And therefore if the *Venercal Ferment* be, though in a very small Quantity, in the Mass of Blood it may be push'd on by heat to the Glands of the Emunctories, though by reason of its Weight it goes downward more easily: And thus we see that there grows certain Tumours in the Groin, which are call'd *Buboes* or *Poulanes*: Sometimes the

same Matter is carried towards the Armpits, and frequently towards the Glands of the Neck, which become thereby very much Inflamed: Sometimes we see the *Pox* of such a sort, that a great number of Glands appear, in which case there is strong ground to believe that the *Lympha* and Lymphatick Vessels have contributed to that Discharge, seeing that according to the Anatomy of the Parts, the *Lympha* cannot pass from the Arteries in the Lymphatick Vessels, otherwise than by the Glands, through which it is filtr'd. If there be a great quantity of the Ferment, the Mass of Blood discharges it self by an Ebullition upon the whole Skin, upon which we may see Spots, which are nothing else but Venereal Fumes, that by reason of their being Gross, do settle on the Surface Blisters, which in a little time grow Hollow, and turn to Chancres or Scabs, as well great as small, Tetters, Boils, Warts, &c. according to the predominant Humour. If the Blood discharge by Sweat any Serous Humours betwixt the Muscles, these Serosities by picking the Members do cause a Pain that is like a Rheumatism. If these Serosities run a long the *Membranes*, or *Nerves* or the *Periosteum*, they cause fix'd Pain; such as are commonly call'd Nocturnal, with which those who have a Confirm'd *Pox* are miserably Tormented. If those Serosities affect the Joints, they shall excite the *Venereal Gout*. If that serous Matter settle at the Roots of the Hair, it causes by corroding the Roots, the Hair to fall off. And this is another, or rather the utmost degrees of the *Pox*; if those Serosities grow hardn'd and confirm'd upon the Bone they produce Nodes, and after that a *Caries* or Corrosions of the Bones, especially if they sink into the Substance, and penetrate the Marrow. 'Tis true there is another degree worse than any of the former, because it makes the Disease incurable; and the Patient is unavoidably lost, which is when the virulent Matter discharges it self on a noble Part, and corrupts it: For besides that, the lost Substance can never be repaired; the bad Symptoms that accompany this *Pox*, and the Condition of the part affected admit of no Specifick. 'Tis evident therefore that there are so many degrees of the *Pox* as

it makes advances to take deeper Root, and that from the Surface it passes to the Mass of Blood, from thence to the Flesh, from the Flesh to the Membranes, and from the Membranes to the Bones. Nevertheless all these degrees which I have described, do not keep the same order, for oftentimes it passes from one Degree to another imperceptibly; and sometimes there is a Gangrene or *Caries* perceived in the Bones without the precedence of other Accidents, and this arises from some particular Dispositions of the Ferment, or of the parts of the Body. So that one part makes a greater resistance than another, and the ferment makes a longer in one part than in another.

'Tis easie by this example to judge of the progress and degrees of the *Pox* in all other kinds: I suppose that a common Woman has this Disease, and though she were not infected, if she has a particular Conversation with many Men, the mixture of many different *Semina* may occasion such a Corruption in the Passage of her *Matrix*, that will degenerate into a proper Virulency. But if the Venereal Ferment which is in the Passage of the common Woman be an infectious *Virus*, and the Passage of the Yard which made a Penetration be sufficiently Open, that *Virus* being put in Motions shall enter the *Urethra* ulcerate that part first, and so by degrees reach the *Prostate* Glands, causing there an Inflammation and Acrimony; and this makes the first degree of the *Particular Pox*, which they call Heat of Urine, and afterwards a *Gonorrhœa*.

This Venereal Heat of Urine may continue in some a longer, in others a less time, without producing the *Grand Pox*; because of the effusion of some other Humours with the *Semen*, that proceed as it may be suppos'd from some Ulcers, and carry off a part of the Venereal Ferment of those Ulcers, and blunt the activity of what remains therein, whence it comes to pass that in such a case, 'tis something slow in its Operation; but when that ferment is volatiliz'd or raised by Heat, the Blood which passes thro' those Parts, gradually attracts into the Mass of Blood, so many Particles as are sufficient to corrupt it. If the Venereal Ferment is yet more Volatile, it passes not only into the

the seminary Vessels, but without any stop, into the adjacent Veins, and mixing it self with the Blood, corrupts that which is next to it, and so on till the whole Mass be infected, and thus there is an *Universal Pox*, when there was no other Symptoms that preceded, which is commonly very surprising, and very much deceives the World. But if Nature be strong before this ferment is multiplied in the Mass of Blood, 'tis separated by way of *Crisis*, and forced towards the Glands of the Groin, where there grows a Bubo or Poulain, and sometimes together, when the Matter is Exuberant: This may happen when the heat is so strong, and the ferment so Volatile, that it is expelled through the Pores, with the Sweat, without the help of Medicine; but it is very rare to meet with such a lucky chance. After this I hope it will be easie to conceive that in what way so ever this Disease is got, it makes very near one and the same Progress, that is, the Venereal Ferment acts by Degrees, beginning at that place, which it first seized, diffusing it self insensibly into the neighbouring parts which it Corrupts, and these corrupting others, until the whole Body be involved in the same *Catastrophe*.

'Tis evident that these Symptoms can proceed from none other, but a cause that is sharp, biting and coagulating, for the *Chancre* begins ordinarily with a Hardness, that denotes the Coagulation of some Juice, and then it becomes another, and this is made by Corrosion. In Heat of Urine there is an Inflammation, Pain, and Ulcer, which shews an Acrimony, the Nodes and Glands proceed from the thickning and coagulating of some Liquors that lie all along the Bones, and in the Glands with which our Bodies abound. The itching that accompanies Scabs and Tetters, does manifest the sharpness of a corrosive or caustick Salt to be the Cause, and the *Caries* of the Bones proves the same.

The effects of the Venereal Ferment do manifest that it is Acid, or Acrimonious since 'tis evident that it condenses and coagulates the Humours, excites sharp and piercing Pains, corrupts the Flesh, Membranes and Bones, as much almost, as other Acids; and ordinarily without any Blackness or

Gangrene, whilst that Corrosion or Corruption that proceeds from *Alkalifate* Salts is always attended with a Blackness, Mortification, and a Gangrene, as in the Plague, the reason whereof is, that an *Alkali* is produced by the force of Heat, it is by so much the more Fiery and Agile, as the Heat from which it did proceed was Violent; nevertheless it does not follow, but that a Gangrene may sometimes seize such parts as are infected with a Venereal Distemper when the Body is much Heated, abounds with Choler, and is under a Fever at the same time, but especially when one is careless of himself, or takes hurtful Medicines, as we have seen some Patients, who had fallen into ill Hands, but that happens by Accident, the Acid of the Venereal Distemper being in less Quantity, or weaker than the *Bile* which is an *Alkali*, for in that case the *Alkali* is Predominant, and being irritated by the Acid, produces effects contrary to those of the Acid: And likewise 'tis from this various Mixture, and their different Proportions, whether in Quantity or Vigour, that we see in the Venereal Distempers so great a variety of Symptoms, and are frequently mistaken in our Judgment about the Nature of that Disease, and the effect of the proper Medicines; wherefore 'tis needful to make our Observations with great Care and Consideration, and not to imagine that all Patients are to be treated or cured the same way.

'Tis sometimes easie enough to discover the *Pox*, especially if one has had some Experience: But it often falls out, that the Signs which appear are so obscure, ambiguous and equivocal, that it is very difficult, and frequently impossible, even for the most Judicious and Experienc'd to know it; I am resolv'd therefore to lay down the most certain Rules, by which this Distemper may be discerned, and I shall give good advice to those who have had the Misfortune to get this Malady, that they may shun the Ignorant, and avoid all Imposture. Heat of Urine is not hard to be discern'd in Men; 'tis somewhat more difficult in Women as shall be shewn: We shall also speak of a Bubo or Poulain, with the *Chancre* each by it self, as a *Particular Pox*.

I have already hinted at the way to distinguish that from the *Universal Pox*, wherein I laid down the different Degrees, which I think was sufficient so far as to prevent Mistakes about it, it being observable in doubtful Cases, that we must always prescribe some remedies by way of Precaution, provided they be no ways hurtful to the Patient. For example, a Nurse by giving Suck to an Infant that has the Venereal Disease, has got a *Chancre* in one of her Breasts, and has had it for some time, never thinking of it, or dreaming of a Cure, although you have no manifest Signs, that this *Chancre* has infected the Mass of Blood. Nevertheless it is very hard to conceive, but that some Particles of the Ferment have glided into the Blood, 'tis prudence not only to mind the particular Cure of the *Chancre*, but also to prescribe some Medicines for cleansing the Blood, as some Doses of *Mercurius Dulcis* mixed with Purgatives proper to the Constitution; or some slight Diet and Regimen, such as may be found hereafter in treating of the *Chancre*, or Universal Cure.

And this is a Rule that is very useful in the cure of the *Particular Pox*, that is, which only affects one single part. As we must not neglect the Remedies of the Precaution; for the Depuration of the Blood, which may have received some Particles of the Venereal Ferment, during the time that necessary Medicines are apply'd to the part Affected; so we must not proceed to the great Remedy, so long as we have no certain marks of the *Universal Pox*: I call that the Remedy, which causes a *Salivation*, which I believe to be most Natural and proper for curing the *Universal Pox*; concerning which I shall now give the Rule.

When a great number of signs do appear, as a *Chancre*, Heat of Urine, Pains in the Night, Nodes, Glands, Scabs, Chancrous Ulcers, and others mentioned in the Description of the *Venereal Distemper* in General every one may know it to be the *Pox*. If there be a *Chancre* and Botch in the Groin, one whereof does follow upon the other, it is a sign of the *Universal Pox*; for 'tis very evident that such a thing cannot happen, unless the Mass of Blood be infected: And it is the same when there is Heat of Urine,

and a *Chancre*, or Heat of Urine and a Poulain, or Botch in the Groin. If one of these three, a *Chancre*, Heat of Urine, or a Poulain is accompanied with some other Sign, as some Nodes, Glands, Pains, Scabs, Virulent Tettens, Caries of the Bones, 'tis a mark of the *Universal Pox*: And also when there is no *Chancre*, Heat of Urine, or Poulain about the Person, if it appear that he was either neglected or ill cured, if any of those Accidents supervene, as Pains, and especially about the middle of the Arms or Legs, a great Scab that is no ways like to an ordinary one, but especially if it happen on the Head, or any virulent Ulcer without an external Cause, it may be believed to be the *Pox*: Nevertheless a Woman may have her *Whites*, which may be taken for a virulent *Gonorrhœa*, and she may have at the same time Pains, which shall not consequently be the *Pox*, unless at the same time when she has her *Menstrua*, the *Whites* flow with the same Virulency, then she undoubtedly hath the Venereal Taint; and therefore on such occasions 'tis needful to proceed wisely in Business, and study to understand perfectly the Heat of Urine.

If there be any *Chancre* in the Secret Parts, or Breasts by it self, or by Medicines, and that *Chancre*, after a considerable time come again in the same place, without any manifest Cause, there is some reason to believe that the *Pox* has pass'd into the Mass of Blood; but if the *Chancre* return in another place, though never so near to the first, 'tis so without doubt. When the Body is cover'd with Blisters, and these Blisters are turn'd into *Chancres*, that is to say into round Ulcers, the sides whereof are hard, and the middle somewhat White, there needs no other proofs to assure us of the *Pox*. Pains alone over all the Body, in the middle of the Members or Limbs, or Nodes or Scabs on the Head, which happen after keeping company with infected Persons are marks of the *Pox*. If Pains be in the Joynts, it requires a more strict Examination, and the Patient ought not to be treated, as if he had the Venereal Distemper, unless there be a Concurrency of more evident Signs, because that may be a single *Gout*, and the same is to be said of a *Rheumatism*. And herein 'tis very easie

easie to be mistaken; for the *Pox* is often concluded under the Name of the *Gout* and *Rheumatism*. Nevertheless, so long as there are no other Signs, as *Chancres* virulent Ulcers, great Scabs, Nodes, or the like, tho' the Pains happen after an unclean Conversation, the Patient is not to be exposed to the great Remedy: And the Nodes that lie near the Joints in *Gouts* give no assurance of the *Pox*, if they are not accompanied with other Signs; for such Nodes are often seen in Gouty Persons, who are not liable to the least suspicion of having that Disease: An intolerable Pain, and such as has not yielded to ordinary Means, has passed frequently for the *Pox*; but in that case 'tis upon some Assurance that the Party has had some *Chancre* or Heat of Urine for a long time, from whence it is concluded that it proceeded.

But upon such occasions as that, he who knows himself to be under those Circumstances, does very little tender his own Health, if he do not consult with the most able Men; and those whose protection it is to cure the Venereal Distemper, will have no sense of Honour and Conscience, if they do not upon mature deliberation undertake his Cure. But no Person ought to be undertaken, as having the Venereal Distemper, so long as no convincing signs thereof do appear, otherwise this were to undertake the Cure without knowing the Disease, and pretend to restore a Man to Health, without any assurance he is Sick.

If the Mass of Blood be seasonably corrupted, it may be depurated by easie Methods and gentle Medicines, such as evacuate gently, or promote Perspiration, with excessive heating of the Body, for which purpose we safely use *Mercurius Dulcis*, Sena, Cassia, Cream of Tartar, Volatile Salt of Vipers, Amber, &c. Diaphoretick Antimony, or the like. There are also some cases, in which 'tis far better to use gentle Means, when we are not fully assured of the Venereal Distemper, as for example; after one has been cured in appearance of some *Chancre* or Heat of Urine, if weariness without Labour, loathing of all manner of Food, an indisposition to the Venereal Action do follow, there is great probability that some virulency is transmitted to the

Mass of Blood; nevertheless, seeing these when single are but doubtful Signs, and may very well be the forerunners of some other Distempers; I think it would be rash to salivate this Person, and therefore gentle means is more preferable.

As also if nothing appears, but some Piles or Warts in the secret Parts, without any other Sign, 'tis not to be thought the *Pox*, because those accidents in that place do frequently proceed from a decay and weakness of those Parts, through a long and common use of Venery: But if together, with such Signs, there be some *Fissures* which run towards the *Anus*, *Chancrous Hemorrhoids*, and Warts in other Parts of the Body; in such a case there is sufficient assurance of the Disease: If there be *Chancres*, with a *Caries* of the Bone in the Palate or Nostrils, I mean such *Chancres* as are perceived in Persons who have the Venereal Distemper, which differ very much from those call'd *Cancers*, 'tis call'd the *Pox*, and is very hard to be cured. If there be a line of Pimples that cross the Forehead, which begins with the impression that the Hat makes, and which does not disappear with a Scab on the Forehead, Face or Head, or Spots in other parts of the Body, if the Party has had any ill Conversation with Women, he may very well suspect it to be the *Universal Pox*.

After what has been said, it will not be difficult to find what is the Prognostick of this Disease, for after having examined, if the *Pox* be Original, or contracted, together with the difficulties which may arise from the Constitution, Age, &c. And by considering what was said concerning its different Degrees, it will be easie to judge that it is so much the more difficult to cure, as it is the more rooted in the Body; and therefore seeing the last degree is that of a *Caries* or Rottenness of the Bones, 'tis also that which is most hard to be cured, especially when that *Caries* is in the Skull or Nose: I will also say that 'tis so difficult, that the Cure thereof ought not to be expected by any use of bare *Mercurials*; because they none of them reach the *Caries*, so as to destroy and remove the Venereal Ferment that adheres to those Parts. I know by experience that the surest course that can be taken

in this kind of *Pox* as by way of *Fumigation* or Vapour which reaches the infected Bones; but seeing this method is somewhat dangerous, and may have ill Consequences, it requires both Judgment and Dexterity to accomplish it.

The Venereal Disease is not commonly Mortal; there have been some who have had it 30 or 40 Years, and when they die it does not so much proceed from this Disease, as from some others; contracted by the Disorders and irregular Courses used in the Cure thereof, or the alterations made by time, and the Constitution or Habit of the Body. Besides, it too commonly happens that the most part of those who are in this Condition, do not suffer themselves to be treated as they ought to be; some are backward, because they have not Money enough to pay for their Cure, others because their business do not permit, a third because they are in the hands of such as have no Skill, or at least want Honesty, to compleat a Cure; there are some Bodies of some singular Dispositions, that *Mercury* cannot

produce the desired effect upon them; notwithstanding all the precaution and means that can be used. Therefore it often falls out by reason of these Faults or Impediments, that the Venereal Distemper is not cured, but only its Symptoms, and that some of the Venereal Ferment does still remain in the Body, which in process of time lodges and entangles it self in the Humours, in such a manner that some inconveniences do afterwards ensue; which are not directly a *Pox*, though they have in effect sprung from it, as their proper Fountain: From thence it is, that there are so many Hereditary Diseases, so many scrophulous Tumours, so many old Ulcers, so many Gouts and Rheumatisms, so many *Whites* amongst Women; and in a word, from thence arise, the most part of those Diseases, which we observe in Families, and which unhappily have only ordinary means apply'd to them, because their source is concealed, and the Physicians themselves many times, dare not be inquisitive concerning their Original.

*Of Mercury; and if it be the Specifick Medicine for the Venereal Distemper:
From the same Authors.*

NOT to stand upon the Etymology that Authors have given of *Mercury*, or its Name, Influence, &c. I shall only say *Mercury* or Quicksilver is a Metallick Liquor, the Nature whereof is as wonderful as it is singular, for it is extremely heavy, coming the nearest to the weight of Gold, which is the most ponderous of all Metals, &c. Although *Mercury* is an homogeneous Body, and it is as easie to separate the Principles that compose it as those of Gold, tho' this principal Metal contains such as are very closely United and well Digested, and those of *Mercury* are not so strongly joyn'd, because it is only a crude imperfect Metal, or rather a substance that resembles a Metal; nevertheless Reason and Experience prove that it contains, first a great deal of Acid Salt, very like that which is in Sulphur

Mineral, which is known by distilling it by it self; notwithstanding this, *Mercury* may sometimes operate not unlike an *Alkali*, but upon a quite different Reason, which is, because its Salt is fetter'd by a great deal of *Sulphur*. There is also contained in *Mercury* a subtle and volatile Earth, a Metallick Water, which makes it Fluid, and a Spirit which is its proper *Mercury*.

It is Ponderous, because it abounds with Salt, and experience shews that Liquors are by so much the Heavier, as they contain the more Salt, and though we cannot gain the Salt there from any more than from some other Metals, neither can we extract Salt from Glass, though we know there is a great deal of Salt *Kali* therein; which shews our want of Skill or Art to perform that of which our Understandings are assured:

fured: *Mercury* is Volatile, and the least Fire makes it Evaporate, it is likewise Opaque, because it has straight Pores, and such as never can be disposed in a right Line, without changing the Nature of *Mercury*, being composed of Spherical Particles that are in a perpetual Motion: It is penetrating, because it easily divides it self into Atoms, and is always a moving: It resolves Tumours, and dissolves Flegm; because it is as aforesaid penetrating, and composed of an Acid, and of *Sulphur*, which are very proper Dissolvents, by reason Flegm contains much of an Acid, wrap'd up in unctuous Matter, and Tumours proceed from Flegm made thick and hard, by an Acid, and therefore the *Mercury* dissolves it: *Mercury* produces cold Diseases in some Persons, and is a great Enemy to the Brain and Nerves, especially when it is taken crude or ill prepared: On the contrary, it heats some others by accident, when it is unskillfully mixed with Purgatives, or prepared with sharp Ingredients that make violent Irritations, which raise an effervescence in the Tumours.

Mercury excites *Salivation*, because when it has once enter'd into the Body, the heat reduces it into a Vapour, and though mix'd with Acid Salts in its Preparation it still retains its round Figure, so that the *Mercury* is the more easily carried to the Brain, when by reason of the cold that it meets with there, and because it joyns it self more readily to the Flegm than any other Humours, upon account of the Acid which it contains, and the Salivary Vessels do always abound with Flegm, that is matter of the *Saliva*, the *Mercury* dissolves the same, and for that reason is more abundantly evacuated by the Salivary Ducts, and seeing the Flegm does extract the *Mercury*, the extremity of the Salivary Vessels is corroded, and likewise the Glands of the Throat and Mouth thereby ulcerated, whence it comes to pass that the *Salivation* or Flux is encreased, and that an extraordinary quantity of Flegm issues out of the Mouth, till the same Flegm has wash'd the Ulcers dry, and so the *Salivation* ceases.

Sometimes *Mercury* does only purge by Stool, and it is thought in such a case, that

it meets with some Alkalious Matter, which makes it let go those Acids and Precipitates the *Mercury* into the lower Parts. It does without doubt proceed from the defect of those Acids, that the *Mercury* not finding enough thereof makes it sublime to the Head, or otherwise there are some Persons who can neither be Fluxed nor Purged with *Mercury*. From thence it is also, that one may be well purged with a small quantity thereof, at one time, and that it shall have no effect upon him at another, for there is not the same quantity of Acids in the Body at all times, which depends on the Diet, the Season and the Passions, together with many other Circumstances, which every one may observe, and from which we must conclude that *Mercury* acts in so many different manners according to the different Dispositions of the Person who receives it, or the manner of its Preparation.

It remains that we examine, whether *Mercury* be a Specifick Remedy for the Venereal Disease. A Specifick Medicine is that which cures a certain Disease at all times, in all places, in all Ages and Degrees; and seeing we have shewn that the Venereal Ferment is of an Acid Nature, that it fixes on the Flegm particularly, it may be said, that *Mercury* is the most proper Remedy yet known, for the cure of the Venereal Distemper; for if it is not become absolutely incurable by the defect of the Person who is tainted therewith, as by the Corruption or Decay of some Noble Part, or the Complication of some Mortal Disease; it is reasonable to believe that it may be compleatly cured.

And seeing there is no better Medicine known than this, and that all others which have been hitherto used are ineffectual, or in all Cases, Tedious and most dreadfully troublesome, we are forced to use it. We may also say that *Mercury* is an admirable Medicine for many other Diseases; besides, I have found by experience that *Mercurius Dulcis* sublimate is a Remedy that will never do any hurt, if one knows how to use it; but it is also so weak that how little so ever the *Pox* has taken Root, it is not to be expected that a perfect cure can be effected thereby; yet there are some Persons of so good a Constitution as to be cured with 20 Doses

Doses of it, provided it be mixed with a purgative and convenient Vehicles; for which take the following Prescription. Of *Mercurius Dulcis* Sublimate, and the Powder of Vipers, of each 6 Drams, Cristal or Salt of Tartar in fine Powder, with Scammony and Troches *Alkandal* 2 Drams, mix them together with so much Powder of Pale Roses, as may suffice to make up a Mass of Pills, of which a Dram is to be taken, with your ordinary Diet, Exercise, &c. I have also found by experience that the Golden Precipitate and *Mercurius Precipitatus perle* may be used with very good Success, the Dose is to 12 Grains, mix'd with a common Purgative, viz. the Polycrest, or the Catholick Pills.

I cannot enough extol these Preparations of *Mercury* if faithfully perform'd, for they ordinarily purge by Stool, and sometimes by Vomit, they must not be wasted before they are used, for then they will lose some of their Acrimony, which was communicated to them by Fire, without which they will not purge as they ought. They may be taken every third Day, unless the Patient have the Looseness or Purging in the Morning, in which the Medicine is to be taken: In the Intervals the Patient may bleed if occasion serves. When there are Nodes or Tetters, or the Body is dry, Baths must be used, for Emolliation of the Parts for Humectation and increasing of the flu-

idity of the Humours, and bringing them to such a Condition as they may easily yield to Medicine; all the difficulty is to determine what number of Doses is requisite to each Person; for though the accidents disappear early, it does not follow that the Patient is perfectly recovered: And therefore to be sure some Doses ought to be taken after all the Symptoms are quite vanished, that no Leven may be left in the Blood; a Decoction of *Vipers* may be given for some Days, by which means, there will be an insensible Perspiration that shall carry off all the rest of the Venereal Poison, and that shall to perfectly cleanse the Blood, that the Patient will be beyond the danger of a Relapse.

There is no *Pox* but what may be cured by these or some such adequate Preparations of *Mercury* internally given, such a degree of it only excepted, where there is a *Caries* or Putrefaction of the Bones of the Nose or Skull, which cannot be thoroughly effected, but by a Method that is extremely troublesome and tedious: And therefore in this case it is better to *salivate* the Patient, not by means of an Unguent, which I would advise no Body to, because of its ill consequences, besides it can do no good in such an Exigency, because the *Mercury* does not penetrate so far as the putrefied Bone, but this *Salivation* must be procured by *Fumigation* or *Vapour*.

Of the Gonorrhœa and Salivation; From P. Paxton, M. D.

UNDER this Head of the *Gonorrhœa* I shall likewise comprise a flowing of some small extraneous Matter at the Nose, Ears, or indeed at any other Passage or aperture of the whole Body of either Sex, whose natural Situations are such, that Matter cannot well lodge, but must flow from them: But these under this Head being so very different in their Causes, beginnings and continuance, it may be necessary for the better comprehending them, to distinguish them into two sorts; as first into such as seem to have been caused from some-

thing actually made within us; and secondly into such as proceed from somewhat received from without us. The first of these being ordinarily either the effect of some Inflammation, which will be painful when ripening, but when once broke, if the Matter meets with no hindrance in its discharge is rarely of any long continuance, much trouble or any danger, for it will soon cure, without outward Application; but if the Matter stops that must be removed. But if such Juices were the effect of a separation from some ill *Dyscrasy* of the Blood, then they

they may give trouble, by reason that must be mended, as may be observed from the *Fluor* from Women, and sometimes even from the *Piles*.

But the second sort that are affected, by something that is from without, as I think may be particularly instanced in the *Gonorrhœa's* got in impure Coitions, there the organical Parts themselves appear first injured by the poisonous Particles then received, which seem to fix first upon them: For we may usually observe the *Genitals*, and the parts appertaining and adjoining to them to be severely afflicted long before there is any appearance of the effects of this poison in any of the remoter Parts: Whereas had it immediately pass'd into the Juices, it must have been by them quickly whirl'd about the whole Body: It is not improbable the reason may be, that the raging Lust and hasty desire of pleasure felt in Congress, may have a power to dilute, or somewhat so to affect these parts, as to render them more susceptible of the poisonous Steams; besides perhaps the Emission yields a kind of Vacancy for their Reception. And these thus injured parts, being so far seated within us as not to permit of Applications immediately to them, whereby to expel such poisons, nor to remove or hinder them from corroding and ulcerating the Parts, upon which they fix, they gradually come to separate and make such Matter as constitutes a *Gonorrhœa*.

But be it as it will, it matters not as to what I chiefly aim at; for I think it is certain these organical parts are usually first affected; and the Blood only afterwards from them, by reason of this running by the *Urethra* is untimely stop'd by improper Applications, the Blood becomes much the sooner infected by the Poyson; as evidently appears by the variety of succeeding Symptoms, which will after that soon break out in very differing Forms. It is true, the Genital Parts being thus alter'd and injur'd by the Poyson thus receiv'd; and being continually supplied by the Blood with fresh Matter, to be converted into such purulent Juices, that flow by the *Urethra*; the Blood afterwards becomes poysoned from these Juices, notwithstanding their Issue is not

entirely stop'd; however, this arising sometime afterwards, seems to be derived, in that the efflux of such virulent Matter, is often by the various Postures of our Bodies, somewhat for a time retarded; for it is manifest such Matter cannot flow with the same Freedom when our Bodies are in a place, as when in an erected Posture.

However, if by repeated Evacuations the Blood is robbed of such Juices, that would have been converted by the thus injur'd Organs into such purulent Matter, that Matter will gradually lessen, and its Virulency abate, and the Parts will contract and heal, that is, recover their former natural State. This being certainly so in Fact, it must be one of these two Things that occasions that mighty Difference, so often to be observ'd in the facility and difficulty of curing *Gonorrhœa's* (supposing the Persons affected to be equally governable) that is, either according to the Degrees in the Virulency of the receiv'd Poyson, or according to the disposition of the affected Person. If a healthful Person, such a one whose Blood and Juices are uncorrupted, that is, in a perfect natural State, be affected, although according to the degrees of its Virulency, it may require more or less time, yet it will be remedied without much Difficulty. But if one is severely affected, whose Blood and Juices are much depraved and vitiated, and so perhaps disposed to preternatural Separations, or perhaps on the contrary, to Inflammations; here these organical Parts being thus injur'd, readily become the Receptacles for such *Peccant Juices*; which being farther chang'd by these Parts, become a new Contagion to infect the whole Body. So that such a case may prove a Work of Difficulty, and require great Thought, as well to correct and mend the Blood, or so to dispose it as that the affected Parts may be cur'd. For where there is nothing more requir'd to be done, but curing these diseased Parts; and the Blood and Body is well disposed for Evacuations, here they alone, if judiciously administred, and rightly adjust'd, will be always found a sure and effectual Remedy. For the purulent Matter there made, being continually spent, and the Parts not receiving proportionable Supplies,

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will naturally and gradually Heal, that is, recover their former State, by reason the Matter not stopping, and the poysonous Parts wasting, there can be nothing to hinder them, there not being fresh Juices to do it, they being carried and turn'd another way. And any Evacuations in this Case, where the Body is well-disposed for them, whether by Vomiting or Glysters, if strong enough sufficiently to move the Bowels, and repeated often enough, will here perform what is usually done by Purging: This I only speak as to their general Use, but not Expediency, as being incumbered with more Trouble and greater Inconveniency in both, and contingent danger in the First. And I doubt not but a Salivation, if tried, would equally do it. I would not be misunderstood, I do not recommend it. Nay, I disapprove it; for this Case, if judiciously handled, can never require so severe a Remedy: But a Salivation turning the Juices by plentifully discharging them another way, must of course hinder the Parts affected of their usual supply, by which means they may, as in the former Case, recover; but of Salivation more particularly in the following Chapter.

Under the third and last Head may be comprised all Diseases proceeding from extraneous Matter, so made and contain'd, that it cannot discharge it self, nor be discharg'd, without manifest Danger to the Life of the Diseased; as when such is prepar'd or collected in the Brain, Heart, or upon the Lungs, or such like, for the Use, Structure, or Situation of these Parts being such, that the Matter forcing its own Way, would be for the most part Fatal; and the Uncertainty and Danger that must attend such Operations, have as yet deterr'd Men from attempting them. For as what hath been perform'd in what we call an *Empyema*, does not come up to what we are now treating: Diseases then created by such Matter must be incurable.

But since Men, wasted in a Consumption, naturally desire to preserve even a wretched and expiring Life; and since it is certain they may by improper and irregular Ways of Living, untimely break or cut its Thread; it will follow, that by religiously

avoiding such things as are Hurtful, and industriously pursuing such as are only Beneficial, or, at least, Harmless, they may spin it out to a greater Length. And since Methods have been establish'd, and Medicines invented for this purpose, I shall here briefly and impartially, for the ease and benefit of Mankind, enquire into the reasonableness of their Use: But that I may do this with some Method, I shall reduce them into these two Heads.

First, Such as seem principally intended to respect the Lungs, that is, the Part immediately Affected.

And Secondly, Into such as only relate to the concomitant Symptoms.

Medicines that may be accounted as belonging to the first of these, may be again considered as of two sorts; *viz.* Pectorals properly so called, and Balsamicks. By Pectorals, I think, may not improperly be understood Medicines that have been esteem'd to have a Power to abate or ease Coughing, by helping Expectorations; that is, the bringing up of somewhat that being unnaturally separated or made from the Blood, was offensive to the Lungs, or some Parts in the Breast appertaining to them. By Balsamicks, may be understood divers kinds of Medicines that are supposed to be endowed with a healing Power, such as are several natural Balsams, and divers fictitious ones in several Preparations and Compositions.

Again, under the second Head, *viz.* such as relate to the concomitant Symptoms, may be number'd.

First, Either such as seem principally intended to respect the Disorder only of the Blood; that is, the hectic Heats, Inquiétudes, and by consequence only the other Symptoms that proceed from thence. And under these may be comprised all such things as are thought to mitigate and assuage that, as Emulsions, divers Preparations of oily and cold Seeds; and if I may name it, for it hath been in some use, the celebrated *Coriex*.

And Secondly, Into such as have been esteem'd not only to cool, but nourish also, and amongst the chief of these are to be number'd Asses, and divers other sorts of Milk, Snails and their Preparations, and the whole Farrago of this Tribe. Or,

Or, Thirdly, Into such as give only some present ease or relief to the most troublesome Symptoms, whether in the affected or any other Part; and under this Head are only to be number'd Opiates, in several Forms and Preparations; for by these the violent Fits of Coughing are quieted, the uneasie Nights are pass'd away in Slumbers, and some Truce is gain'd from the Troubles of a walt-ing and wearied Life. Under some of these Heads, may be comprehended the principal Methods that are in ordinary Use in this Disease: With what Success every one's Experience will best inform him, if he please but to be impartial and heedful in his Observations. I shall only examine into the reasonableness of them, and what I think may be expected from their Use, according to such Principles that are known, and are certain.

First then, as to Pectorals, supposing, but not granting, them to be endowed with a peculiar Power to lubricate these Parts (which, by the bye is, inconceivable) and also to help to divide, part or unloosen tenacious Matter that here sticks or adheres, and so by that means to besit it with greater Ease, to be by the help of Coughing discharged: Yet in what we call Consumptions, what Benefit or Advantage can be reasonably expected from them? Because in such the purulent extraneous Matter is already made, segregated and lodged, and cannot be expectorated by reason of the Structure and Situation of the affected Part, and not from any unfitness in the Matter. So that if Pectorals were of any real Use towards the separating such Matter by the Lungs, they could be here of no Advantage; by reason that here there is an unnatural and faulty Separation, by which the Body wastes, and Life is thereby endangered, and why then to be encouraged? But in reality, I am apt to think, there is no such Effect attends them, for if sometimes they seem to facilitate Expectoration, they seem to do no more than unloosen the mixture of the Blood, and in that perform no more than what is common to other Medicines helping Separations. However, in this Disease we may observe that whenever Matter is so congested as to cause Coughing, that part

of it that was in the reach of that Motion, will be discharged, upon which usually the Coughing ceases, and then by Intervals, repeats as the Parts seem by this means solicited; and thus returning, it will ordinarily be again brought up, until such time as they, viz. the Lungs, become so much impaired, injured, or rotted, as they become unfit for such a Performance, and then that Discharge ceases; not for want of Matter, for perhaps the Lungs are full of such, but want of a Power, Capacity, or Ability of the affected Parts: And thus we may commonly observe Expectorations in such Cases, stop before Men die. And that this is so, I think appears farther evident in what is call'd *Consumption pulmonis*, where Matter coming to such a Fulness, is discharged by violent Coughing; which Coughing does again cease until fresh Matter being fully congested, it is again occasioned and then repeats. For whatsoever is brought from the Lungs, must be by the Motions of the Parts contributing to Respiration; by reason what is once separated from the Blood, and so without the power of the Circulation, becomes under the Laws of Gravitation, and so must descend, so that it cannot without such Assistance be raised up into the Mouth. For this noble Machine, a humane Body being made out of the common Mass of Matter, and so only differing from other Bodies; but as it is more excellently formed, and more divinely fashioned, does remain in all its Parts incident to the Laws of Motion, whether it be received by Impulse or Gravitation, as all other physical Beings are. It is true, the great Author of Nature hath superadded to this Mass of Matter, that thus constitutes a humane Body, an active Power of beginning, altering, continuing, or hindering Motion in some particular Parts that are ordained for such Uses as properly belong to a free and intelligent Being, as every individual Man may easily experience himself to have Power to move or not, to walk or sit still, to do this or not do it: Which Power far transcends, and is exceedingly different from any thing that can belong to meer Matter; but yet that Power is limited to some Parts only; for such as are immediately subservient to Life, are not

under it. Thus it is not in our Powers to, regulate or alter our Pulse, the Motion of our Bowels, or such like. Neither can we by any immediate Act of the Will, discharge or remove any unnatural Matter, made or deposited in any particular Part, as not having Organs whereby to do it. If therefore such is prepared or collected in a Part so situated or formed that it cannot flow out of it self, nor be discharged by the Motion of the organical Parts, by reason of some default in such Parts; to pretend, or to propose, to besit this to be discharged, which is already in its very Nature fit, seems to me mere trifling, since there is nothing wanting for its Discharge, but a Power and Capacity in the Organ, by which it should be done. For it being here to ascend, there can be nothing but a force from some organical Motion that can raise it upwards. And to this it is evident, Pectorals can contribute nothing, and therefore in this case can be of no use. It is true, there may be some things that carry the Name of Pectorals, that may be of some small Advantage in the present Case, such as *Tablets*, *Troches*, or *Lobochs*, but then not properly for such Ends as seem to require Pectorals; but only as being held in the Mouth, and gently swallowed, do someways lubricate and please the Parts about the *Fauces*, that they are not so readily drawn into Coughing, whilst their Effects remains; so that somewhat may be here offered in Justification of their Use; but how far that will balance other Inconveniencies that may arise by 'em, I humbly offer to be considered.

But as to the second sort that I have termed *Balsamicks*, I can see nothing that can be hop'd for, or promised by their Use. For if they are given with an intention of digesting, cleansing, healing, or someways curing the affected Part, they are a Jest; for what one Instance in Nature can be given wherein the part can be healed or cured, so long as the Matter lodges in it? For the Part being the Cistern to contain it, How can it be so brought together to be healed or cured, when the very Matter that is in it must hinder such Agglutination? The very supposing it is a Contradiction. Neither is it ever attempted in Chyrurgery, where to

pretend to heal, before the Matter is discharged, would be looked upon as an Effect of the oddest Ignorance. It is true, some, both natural and factitious Balsams, are experienced in Chyrurgery, to be noble and useful Remedies: That is, being sometimes applied to a sore Wound or Ulcer, they so dispose and alter the Parts of it, that the Matter that is there made, becomes afterwards digested, that is, so bettered in Colour, Nature, and Consistency, that the grieved part is experienced to be in a promising Condition; but this change thus made in the Sore or Ulcer, by means of which the Matter thus becomes Digested, seems only done in that the Balsam being applied to the Sore it self, so alters the Surface of it, that the *Pus* that is there made, becomes so much bettered; for it is evident, the Blood, from whence this is by the Sore separated, is not by such an Application mended. So that although Experience teaches us that Balsams thus outwardly applied, are really useful Medicaments to digest and better Sores, and so to dispose them to heal; yet we cannot from thence infer they will be so if inwardly taken; by reason the first proceeds from the immediate Application of them to the griev'd Part, but the last must be done by altering and rectifying the Blood; between which two so different Effects, there is no manner of Connexion or Agreement. Neither will I suppose this way of Reasoning be allowed in other Cases, for if it should be taken for a Rule, that any Medicine that will digest or dispose a Wound to heal, if outwardly applied, must do the same if internally administered: The same Effects may with equal Reasons be expected from all other sorts of Medicines, and then that which is an Escarotick, that is, will suppress, eat off, or destroy, loose and unnatural Flesh, if applied to the Part, may therefore, if internally taken, eat off a Carnosity, or root out a *Polypus*, which, I believe, few will be so bold to venture, or so vain to expect. It is true, Ulcers, Sores, or Wounds, are always found of easiest Cure in such Persons whose Bloods are in a natural and healthful State, and on the contrary attended with more or less Difficulty according to the degrees of its Corruption;

so that sometimes there is a necessity to correct and mend that before outward Applications will have their desired Effect: But then, I apprehend, this will not be always done by Balsamicks, but by Methods and Medicines adjusted to the particular Cases; not but Balsamicks may sometimes in such Cases have their Use. Farther, I never as yet, could observe any one internal Exulceration that ever could be said to be really cured by Balsamicks internally taken. In *Gonorrhœa's*, where the Matter does not often lodge, and therefore if ever of any such Use, it might reasonably be expected from them there. Yet even there I need not insist upon the Instance, it being so notoriously known, how wretched, how trifling and how unsafe they are, if only relied upon; and if ever of any Advantage, it is only when gave in such Quantity, that they Purge, and so only answer what would be done by other Purgers.

The next thing to be consider'd, is the second general sort of Medicines that seem principally to regard the Symptoms that are rooted immediately in the Juices, and so are common to most parts of the whole Body, such as are the hectic Heats, with the Consequences to that, and the wasting of the consistent Parts; and these Medicines, although before branched under two sorts, yet here may be conjointly consider'd. Amongst the chief of these are to be number'd several *Milks*, *milky Distillations*, *Emulsions*, divers preparations from *Snails*, cooling and oily *Seeds*, with their various Compositions, all which seem to be levelled, to cool and mitigate the hectic Heats, and to nourish and restore the *consistent Parts*.

It is most certain some *Meats* and *Drinks* have a power to heat us, and it is as certain, that when we continue preternaturally Hot, we are not well; and then we covet such things that will cool us. But whether there is any Substance in Nature that can really do this, shall be our present Enquiry. To form a right Judgment of this, it will be necessary, first to consider Heat it self.

Heat, when taken as appertaining to a Substance, is only the Motion of its minute Parts; but when consider'd in relation to Men, imports such a degree of Motion that exceeds that of our Sensories.

But altho' Heat is thus taken when applied to Substances existing without us; yet when we consider it in our Bodies, we speak of it under another Relation; for not then being able to examine the Degrees of Motion by our own Sensories; we appeal to such things as are often the Effects of Heat in us; and esteem and judge of Heat by such Appearance. Thus because a quick *Pulse*, a dry *Tongue*, a high-colour'd *Water*, a scorching *Thirst*, &c. are Effects of what is called a preternatural Heat, (to distinguish from what is natural) whensoever we are afflicted with such Symptoms we complain, or at least accuse our Heat: And whatsoever mitigates or abates those Symptoms are usually esteem'd cooling.

All those Symptoms that are usually esteem'd the Effects of Heat, are plainly formed by the Blood, and are founded either in the Violence of the Circulation, or some defect or fault in the Separation; and therefore always vanish when these two Things return to their Natural Tempers and Conditions.

Of Salivation from the same Author.

HAVING thus perform'd what I promised, I shall only say a word or two of *Salivation*; which is an extraordinary and preternatural Separation made, caused or effected by *Mercury*, or its preparations from the Blood, by the Salival Glands, and from thence discharg'd out of the Body.

But although the Salival Glands are the instruments by which this evacuation is perform'd, yet it is not effected like Vomiting or Purging, but by the means of the Blood it self: For the Blood being disturbed by *Mercury* breaks, colliquates, divides and spews out some of its parts by these Glands

Glands: and that this is the real Method, by which *Salivation* is effected, appears by these following Reasons.

First, In that the Salival Glands have no Motion of their own, whereby to procure or promote this Evacuation.

Secondly, In that there are no Passages by which the Mercury can be conveyed to these Glands, but by the Blood.

Thirdly, In that there appears evident Marks of Disturbance in the Blood, proceeding and accompanying this Evacuation; for it moves and circulates, fluctuates, and sometimes spews out Parts by other Passages, viz. Vomitings, Looseness, &c.

Fourthly, In that Salivations may be diverted or hinder'd by Purging; that is, by turning that Separation of the Blood that ran by these Glands into the Bowels.

By all which Observations, it is evident, the Blood is first tainted and disturbed by the Mercury, and these Glands only by the Blood, and are no more than the Sinks to carry off the foul Parts of the Blood, which by the force of Mercury are brought this way.

Mercury being observed to have this certain Power to break, colligate or some-way so to affect the Blood, as to cause it to separate, purge, or defecate it self by a Flux thorough the Passages in the Mouth, which discharge continuing for a considerable Time (as Days or Weeks) the Blood has leisure and opportunity to purge and purifie it self; that is to separate, divide from, and exterminate its poisonous, offending, and Disagreeable Parts, and by that means to become more homogeneous and fine.

And as the Blood thus throws off its impure Parts by this Evacuation, so it is plain the Advantages that are received by this Evacuation, are chiefly owing to the long and uninterrupted Continuance of it, and not from any thing specifick in the Mercury, for the Mercury only puts the Blood into this Condition of purging it self; and if therefore the Blood is able to cast out the hurtful Parts, it hath by this means an opportunity of doing it; and although the usual Method is by the Salival Glands, yet sometimes it happens otherwise.

For it is most certain, such is the Nature

of this active Mineral, or any of its Preparations that retain its Nature, that if they are given or applied in Proportion, they will so disorder the Blood as to put it in a state of purging, fretting, or someways spewing out its Parts, I do not say this will be always of Advantage to the Diseased, for that must be as it is properly or improperly applied) neither will it be in the same manner, for that will depend upon the Disposition of the Blood, and the Aptitude of the Vessels, for *qua data porta ruit*, it will break out, or pass where it meets with least Resistance. But, I say, it will always some way so affect the Blood, as to make it spew out some of its Parts, and by that defecate it self. It is true, this will not be equally performed in all Persons, neither in the same quantity, nor by the same Way: Yet this is the certain effect of Mercury, and what it will always do, if administered or applied in Quantity, and but admitted into the Blood.

Mercury is a Substance so opposite and repugnant to the Nature of our Blood, that if received in too large a proportion into it, hinders, perverts, and destroys those very Actions and Functions, in which Life consists, and is never admitted into the Mass, but it gives some Disorders (in proportion to the quantity of the Mineral, and the Disposition of the Blood:) And by these Disorders, it becomes disposed to make various Separations, which are salubrious or dangerous, according to the Course it takes in making them: Wherefore Physicians with great Caution and Judgment, often direct them towards the Bowels by Purgings. And as the real Operation of this Mineral consists in that it disposes the Blood to those Separations by which it purges, defecates, and purifies it self; that is, that it exterminates the peccant, offending, or poisonous Parts by them: It must follow, that the happy Successes to be obtained by its Use, must absolutely depend upon the Continuance and Proportion of the Evacuations, in that the Blood may have time and Opportunity to do it; and not from any thing specifick in it, or in any of its Preparations. It is true, by preparing of it, its poisonous Qualities may be laid asleep, or perhaps destroyed

stroyed, at least they may be mitigated or lessened.

But then those Powers, Virtues, or Efficiencies, by which it only disposes the Blood to these Separations, and by which its happy-Effects arise; (which seem to be the main end in giving of it) must likewise be either destroyed, or in proportion lessened, by reason they proceed from these very Qualities: So that then to attain the same Effects by such Preparations, they must be proportionably increased, or otherwise they cannot perform them; and then the Question is, whether they are not equally dangerous? For if they do not, it is plain they have changed their Natures, and so are no longer to be esteemed Mercurial. Besides, I never yet could observe any one Preparation of Mercury that was administered with real Success, but it hath someway more or less disposed the Blood to Separations, that would be succeeded with some Evacuation, sooner or later, according to the Power of the Medicine: It is true, that where they have been given in some small and trivial Quantity, it hath not always been heeded, by reason perhaps such have been endrowned or lost by intermediate Evacuations.

In a Salivation then, the Blood continually purges and purifies it self by discharging such Quantities by the Mouth, and and sometimes likewise by other Passages, and during which, it hourly receives such Supplies of thin and harmless liquors, which readily running out at these Vessels, must wash out, and carry away peccant, offending, or incongruous Parts; so that the remaining part of the Mass that continues red, and circulates, and is only called Blood, which keeps in its proper Conduits, and will not pass these Vessels, will become somewhat more homogeneous and agreeable, although it does not always follow in respect of the Man, that it is better'd (which are two different things) for Salivations are not always Advantageous. And in this powerful Operation, the Blood seems to do nothing uncommon or extraordinary, for it every Day purges and fines it self by these and other Secretory Vessels and Passages, with this only difference, that the Blood by the Use of Mercury is more disorder'd, broke,

or altered, whereby it is more disposed to Separations; and the Mercurial Particles being received into the Blood, in such proportion only, that they are able to create this Disturbance, but not in such a quantity to destroy Life, in hindering the Circulation, are again expelled by these Vessels, as being offensive and disagreeable to the rest of the Blood; and in their Passage here, they someways wound, alter, or injure these Glands, by which means they heating, swelling, and enlarging, do give more liberty to the Blood to run this way; and the Pores or Passages of these being enlarged, by reason they are swelled, admit of larger Quantities of these Juices, to strain thorough 'em, by which means the Blood more powerfully defecates it self. And this is abundantly confirmed, in that the Success of a Salivation, in such Cases where it is of real use, is always answerable to the height and continuance of it. So that in this Operation, the Blood seems to do no more than what is naturally performed in all Fluids made up and compounded of different and unlike Parts, for such being undisturbed, will sooner or later fine and purify themselves, (and this may be hastened by Art) that is, as they will by a Motion natural and congenite to themselves, part, divide, separate, or expel their incongruous and heterogeneous Parts; so that Motion may likewise be intended by the Admixture of some disagreeable Body with it, and thereby its Separations hastened and increased. With this only difference that such Liquors being quiet and free from an external Impulse, act in their own natural way, and so despume themselves by justling and tumbling the unlike parts to the Top, Bottom, or Sides, according to the Laws of *Hydrostaticks*. But the Blood being hinder'd in this, by the circulatory Motion, by which its parts are continually blended and confounded together, that there is neither space, leisure, or opportunity for that Performance; the Despumation is done by the Secretory Vessels, which are so excellently fashioned, as readily to let pass such parts as are useless or hurtful to the Blood. And when a Secretory Vessel becomes pained, inflamed, and swelled, it seems to be more susceptible of these Juices, the Blood being called.

called in greater Quantities that way, (as appears probable by the unusual Pulsations upon such Parts) and then being disposed for Separations, it may the better by this Operation deliver it self from all offending Matter.

Whereas in other Evacuations, such as Vomiting or Purging, which being performed only by the Motion of the Organical Parts, whatsoever is evacuated by them immediately from the Blood, must be brought into the Bowels, by that very Motion by which they are made, and therefore can be of no longer continuance than that Motion; the Blood being only forced to separate that way by that their Motion, and not by any internal disturbance in it made by the Medicine; and therefore such Separations never out-live the Motion of the Bowels, as will appear most evident to any one who will but impartially consider or observe them. However, if we but reflect upon the nature of our own Bodies, it will plainly be found impracticable so to continue Evacuations made by organical Motion, as to make them answerable in their Effects to a Salivation: For should we suppose the Blood to be equally disposed to part with its peccant Matter by these Ways, as by the Salival Glands; yet such Matter being diffused through the whole Mass, the Blood could part with no more of it during such Operations, than what could be separated by the Vessels about the Bowels in that time, for what was not there, could not pass there; and if we but weigh what Juices during the short time of such Operations, in proportion to the whole Mass, can there pass, and what Moiety of noxious Matter with them, we shall easily collect why a Salivation must be in some cases the more powerful, as it is the most lasting. Besides, the parting or separating of offending Particles, seems to be a leisurely Act, being rather hindred than assisted by such Violence as is requisite to those Evacuations, and to continue these, seems unpracticable, by reason our Bodies are so constituted, as to require a daily Supply of new Juices for natural Uses, which must pass into the Blood, which they could not well do, should Purging or Vomiting be so conti-

nued; by reason they would constantly discharge such; so that although we should eat and drink, yet our Bodies being thus defrauded of all Nourishment might starve. Whereas in Salivations; what we take, passes into the Blood before it can be again by that discharged; so that our Bodies may receive some Benefit by it, and be delivered from those Inconveniencies that attend the other, which are also in their very Natures impracticable to be thus continued.

In short, Salivation being nothing in nature but the Effect of a mighty Separation made by the Salival Glands, occasion'd by Mercury or some of its Preparations, which being in its Nature highly disagreeable to our Blood, will some way so marvelously disorder it, as to cause it to purge, divide from, and throw out several of its Parts this Way; by the means of which, such peccant, moribick, or poisonous Matter that was latent in the Blood, and will associate and pass off with these Juices, is otherwise exterminated with them; and this Operation being so very lasting, the Blood has thereby time and opportunity to free and extricate it self from such offensive Matter, and that this is what Mercury really performs in our Blood, appears abundantly manifest in that, if the Quantity of it be too much enlarged, instead of a Medicine, it becomes a Poison; that is, instead of curing, it destroys; for the Blood being disordered and over-powered by the Quantity, being unable to purge and despume it self by these or any other Passages, it swells and expands in its own Vessels, by which means its Circulation becomes gradually hinder'd, and at last suppressed, and then the Diseased dies. And thus the effects of Mercury are, and must be as the Proportions are adjusted (not that all Bodies will be equally affected by the same Quantity) for if it be too sparingly administered or applied in such Cases as really deserve its use, it does too little, as not disordering the Blood enough, whereby it may be empowered to defecate or purge it self: But if in too great a Quantity it does too much, for then it puts it into such a State as it cannot rightly Purifie.

Of the Method of Curing the Venereal Distemper, and that Salivation is the most short and the most certain way, provided that the Mercurial Unguent be not made use of to excite it: From Mr. Blanchard's Treatise.

IT must be agreed upon by all, that the Pox may be cured by all such Methods, as will effectually evacuate the Phlegm, in which the Venereal Ferment does particularly lie, and which will depurate the Blood; and therefore, Sudorificks, Diureticks, Vomits, Purgatives and Salivation are the means that are the most proper and convenient for that end.

But after all, I must freely declare, that although these Remedies be all good, yet Salivation is to be preferred to all the rest, as being the best, the shortest, the surest, nay I will say, the most natural Method: For if we observe the Oeconomy of our Body, and the ways which Nature has provided for the Evacuation of superfluous Humours, we shall find that she voids the Excrementitious Matter that remains after the first Digestion, with the more gross Parts of the Bile and the Pancreatick Juice, by Stool; the superfluous Serosity (after it has served as a Vehicle for the Nutritive Juice, with which all the Parts of the Body are nourished) partly by the Veins, and partly by insensible Transpiration; the menstrual Blood by the Matrix; the Hemorrhoid Blood by the Hemorrhoid Veins; some other particular Excrements by particular Passages, as by the Ears, the Hair, by Expiration, &c. And, Lastly, as to the Pituit or Phlegm, the Salivary Vessels are appointed for the Evacuation thereof: The likeness that is betwixt the Pituit and Saliva is well known; they being the same Matter, and only differing in Consistence; for the Saliva is the first Matter of the Pituit, the Saliva is continually

swallowed down, and when it is in the Stomach, it grows Thick, and in the Digestions, it does intermix it self with the most Viscous Part of the Aliment, and is afterwards carried into the Gut called *Duodenum*, where it does continually mix it self with the Bile and the Pancreatick Juice, which make a Fermentation together, by the means of which it does so fall out, that the more gross Parts are precipitated, or forced downwards with the Excrementitious Matter, to be evacuated by Stool, and the purer part is carried by the *Vene lactea* to the Heart, and from thence, by the Arteries, to all the Body, with the Blood, from which it is gradually separated by the conglomerated Glands that lie on either side of the *Mandibulum*, and from thence it is carried by the Salivary Conduits, to the Mouth, in which the Pituit that descends from the Brain, does mix with it, there being a considerable quantity thereof, produced in the Head, by reason of the coldness of that Part, which Pituit does insensibly pass through the *Infundibulum*, from whence it is filtrated, thro' the Pituitary Gland, into the Mouth, so that it is easie to comprehend how the Phlegm is carried from all places of the Body into the Mouth, and that by its natural Motion; and therefore, in a Salivation, which is excited by Mercury, the Phlegm being put in a quicker Motion than ordinary, does easily draw to it self all the impurities of the Mass of Blood, and especially the Venereal Ferment, because of its Acidity, as we have said elsewhere, and by that means the Blood is compleatly Purified.

It is true, that it seems that the sweat may effect the same; which certainly would be so, if we had a Sudorifick, that could without any Violence, separate the Pituit from the Mass of Blood; but seeing it is Viscous, it is very difficult, to reduce it into Vapours by any Remedies that we know, to the end that it may transpire through the Pores of the Skin; and if one will needs attempt it, he must heat the Body very much; whereas the Maxillary Glands have naturally a Configuration fit for making this Separation; which is enough (without using other Reasons) to prove, that an Artificial Salivation is only an imitation, and an Acceleration of the Natural.

They also who are conversant about this Matter, know by experience, that it is more difficult to stop a Flux than to raise it, and therefore they who give it by the Unguent do always expose the sick to a mortal Danger, because they cannot measure the Quantity of the Mercury, which ought to enter into the Body, for putting that Pituit in Motion, which is not precipitated, and opening the Pituitary Vessels by little and little; whence it does come to pass, that a great deal thereof does enter into them at once, which makes the Pituit, and the rest of the Humours ascend to the Throat and Head, and produces Inflammations, which are ready to choke the Patient, a thing which does very frequently fall out; upon which account, every one concerned ought for the Future, to think of such means for exciting Salivation, as may be gentle, and safe.

This did oblige me to apply my self with all diligence and search for another kind of preparation of Mercury, than what is to be found in Authors, by the means of which I can excite a Salivation, by giving, at the most, half a Dram thereof, to the strongest Person, in four or five Doses, which will also Purge by Stool, and a little by Vomit, Urine and Transpiration; and will give Motion enough to the Phlegm to pass by the Mouth for as long a time, as when Salivation is excited by Friction, but in a manner that is incomparably more gentle, all the trouble which ensues upon Friction, being thereby avoided, which to speak the truth, is so great and intollerable (besides the dan-

ger to which the Sick is exposed) that if those who have the Venereal Distemper knew the same, I am verily perswaded, that there is not one of them amongst a Hundred, but would rather choose to endure the Disease all his Life-time, though it should be never so short, than meddle with such a mischievous Remedy.

That I may make it appear how intollerable that Method is, I shall shew in what manner those that have the Pox are commonly treated when they are to undergo Salivation by way of an Unguent.

I suppose that the Patient hath no other Disease in complication with the Pox, which would require distinct Remedies, that ought to be first given, and that the Venereal Distemper is only to come under Consideration.

I do likewise suppose that the Person that is to undergo the Friction is of a good and strong Habit of Body, to engage with the Remedy, without any great Preparation, for the correcting of the evil Qualities that are predominant in his Blood.

Now the Patient is to be prepared, *First*, they give him a Glister to dispose him for Bleeding; the next day they let him Blood; and afterwards repeat Bleeding, according as the Patient is more or less Sanguine or Plethorick. They purge him at least, three or four times, for carrying off the more gross Excrements; and after that, they bathe him for eight or ten Days, to make the humours Fluid, to open the Pores of the habitude of the Body, and to make the Mercury pass more easily through the Skin. Some, for the better opening of the Pores, give a Sudorifick, putting them three or four times in a Sweat, placing the Patient under a Canopy, Archet, or any other Instrument proper for that purpose: And in the mean time, they give him a Pisan to drink, to cause Heat, and put the Humours in Motion, and withal diminish his Diet gradually, till he be wholly reduced to Broths.

After that, they begin Friction, with the Mercurial Unguent, which they have prepared before: This Unguent is ordinarily prepared to this form, or some other that may be reduced hereunto, by putting more or less Mercury in it. Take six Ounces of Quick-

Quick-silver, beat it in a Marble Mortar, with it's cover of Wood, with three or four Ounces of fine Turpentine, when the Mercury is extinguished, add thereto a Pound and a half of Hoggs-lard, and one Ounce of the Oil of Laurel; the Unguent must be beaten a long time, for dividing the Mercury, the beating being to last for the space of seven or eight Hours, this is called the Gray, or Neapolitan Unguent, which is the same that the Apothecaries sell for the Scab, with this Difference, that the latter has a less mixture of Mercury.

This Unguent is then taken, and after having made a great Fire, with a Screen before it, they make the Patient warm himself in his Shirt, that the Unguent may make a farther entrance, and they rub it on him, for that time, very well, from the Soles of his Feet to above his Knees, and from the Wrists, to his Shoulders, using in this Friction, two or three Ounces of Unguent; after that, they put the Patient in a Bed very warm, obliging him to keep very close and covered, having, before that, so order'd the Bed and all the Room, that the Air is shut out, and the wind can have no entrance, keeping a good Fire on, by Night and by Day, even when the weather is but moderately Cold.

The next day following, they put the Patient in the same Posture, and making use of a little more of the Unguent, they rub all his Body (the Head, the fore-part of the Breast and Belly being only excepted;) and afterwards commit him to his Bed warm as before.

On the third day, they repeat the same, and if they do not perceive the marks of an approaching Salivation, they continue the like Method, by a fourth, a fifth, and a sixth Friction, if after all, the Signs of Salivation do not appear, they think it the best way (instead of using more Frictions which may prove mortal) to give the Person, a small Dose of *Mercurius Dulcis* by the Mouth, to determin or begin the Salivation.

Then it is, that whilst the Mercury, ascends to the Head, the Patient finds pricking Pains in his Mouth, which are followed with Ulcers therein. And because the Phlegm

is ordinarily carried thither with a Rapid Motion, it does draw along with it self the other Humours, which inflame all the Head and Throat, and put the Patient in danger of being Suffocated: Yet if the Salivary Vessels be opened, and the Pituit sufficiently Fluid, it does run swift enough, and two or three Pounds of the Saliva are every day evacuated at the Mouth.

This Salivation, that it may answer the Design, ought to continue at the least for the space of fifteen, and at the most, thirty Days; and during that time, the Patient is to eat nothing but Broth, some yelks of Eggs upon the Remission, and a Ptisan made with *Guaicum*, which is something offensive to the Taste.

They give the Patient a Glister every other Day, and sometimes purge him gently, especially towards the end of the Salivation, which being over, they give him a formal Purge, they let him again Blood, and put him to Sweat, according as he is more or less dried by the Salivation.

To this it must be added, that the Patient is not to stir out of Bed, and that his Linen must not be shifted for seven or eight Days, and that he must wear the same Shirt that he had on when the Friction was begun, which would be no matter of great hardship for some old Soldier, who might possibly wear a dirty and lousie one much longer time; but for those Gallants who pretend to neatness, I verily believe, that they need no other Article of Penance from the most rigid Confessor.

What has been said of this Matter, is supposed to be in a Man's Case; for, as to the Female Sex, if their monthly Courses do not proceed regularly, proper means are to be used to regulate them, before the Remedy be applied, and if the Woman be with Child, there are Measures to be taken, with regard to all Particulars.

I also supposed, that the Persons who receive the Friction, are of a good Habit and easie to be cured; for seeing by this Method, the Mercury has entred into the Body without any Proportion, and that this entrance does depend upon the disposition of the Pores of the Skin; it does frequently happen that those Pores are very much shut, and that

only a very small quantity of Mercury does enter, which not being capable to dissolve the Phlegm, which is over all the Body, does still leave some Venereal Ferments behind, upon which occasion the Pox does quickly appear again. And when the Pores are too large, a great deal of Mercury gets an entrance, which does attenuate the Phlegm with too great Celerity, and draws it to the Head, and to the Salivary Vessels, with the other Humours, whence not only a danger of Suffocation does ensue, as we have said, but also this precipitated Motion does hinder the equal distribution of the Mercury, through all the Body, and the resolution of the coagulated Humours, which the Mercury would otherwise perform therein; so that in this case there can be no Cure any more expected; it is so far true, that a great or small quantity of Mercury does signify nothing in this Method; and nevertheless, it does not depend on him who does manage the Friction, to make it enter more or less, as we have said, but wholly on the Disposition of the Pores; whence we may draw this Consequence, that those who undergo a Method of Cure by the Unguent, are not restored but by Accident, and that they are more obliged to their good Constitution than to the Physician who prescribes the Medicine.

That will not happen, if Salivation be excited by taking Mercury at the Mouth, because in this case it may be entertained as long as it is thought necessary, and also augmented, when we perceive that it is not copious enough.

This way of Salivation is not dangerous, because it is excited by little and little. It is more gentle, because there is one part of the Matter discharged, which the Mercury does evacuate by Stool, Vomiting, Urine, and Transpiration. It is not troublesome, there being no need for all that dolorous Fatigue, to which the Patient is exposed by means of the Unguent, and by this Method, he may get out of his Bed when he pleases. It is short, because this Remedy is given to all, and the time from the giving of the Mercury, to the appearing of the Salivation, being ordinarily but six or seven Hours, is sufficient to prepare the Patient, if need be;

and this Preparation is only some Bleeding, which is done to those who stand in need of it, and some Broth made of Herbs, to those who are of a hot Disposition of Body; the Salivation being once over, there is a purge given with some Royal Pissan, and the Work is done.

It is true, that when the Skin has been infected, some gentle Sudorifick may be given by way of Precaution, viz. a Glass of the Water of *Carduus Benedictus*, with a little Cinnamon Water, and some drops of the volatile Spirit of *Sal Armoniack*, to be drank every Morning, for three or four days together; which is an admirable Remedy for procuring Sweat without any Trouble, in a manner that is the most gentle that can be imagined. If it be advisable to sweat more copiously, there may be six Grains of the Volatile Salt of Vipers added thereunto.

This Method of procuring a Salivation by Mercury taken at the Mouth, is not unknown to able Men. It is also practised in Places of greatest Renown. Some make use of crude Mercury, which is extremely dangerous, for Reasons mentioned elsewhere; others, white Precipitate, which I do not believe to be without Danger, because it is prepared with *Aqua Fortis*, the salt Spirits of which do unite themselves so strongly to the Mercury, that they cannot by any Means be again separated, though it may be sweetned with washing, and the Spirit of Wine, and may be also prepared without *Aqua Fortis*; but since I have not seen these Medicines tried, and have great Cause to suspect them, I will not determine any thing concerning them.

I only know, that *Mercurius Dulcis* sublimate, which some use, is not in the least dangerous, by reason of its Preparation, which Experience has confirmed to be very good: But seeing it is necessary that a great Quantity thereof be given to each Patient, there having been one Person that had the Venereal Distemper in the first Degree, who took more than six hundred Grains before his Cure could be effected; I shall not make use of such a Remedy so long as I can make a Salivation with a Mercury that is more sweet than that, and in so small a Quantity, that the Work may be

be very easily compleated, by taking fifteen, or twenty Grains, and at the most thirty for the most robust Persons, in three or four Doses.

To make it appear that the Thing is very easie, we must make the following Observations, which shall withal, most clearly contain all the Process that I use in my Way of preparing Mercury.

First, To proceed upon sure Grounds, we must banish every Thing that is sharp, for the Mercury does find enough of that in the Bodies of those who have the Venereal Dislemper; there is also enough in all Bodies, which joins with it, and gives it Force enough to open the Salivary Vessels.

Secondly, Seeing Mercury is a great Enemy to the Brain, and to the nervous Parts, when it is crude or ill prepared, it must not be given Crude, nay, not with a Purgative, which sends it off by Stool, for this is not the way to procure a Salivation, because it cannot be doubted but that there is a way to prepare it so, as it shall not be dangerous, as we see for Example, in *Mercurius Dulcis*, which is known by Experience to be a harmless Remedy.

Thirdly, That in what manner soever Mercury be prepared, it cannot never be so divested of its own Nature, but that it will always keep a Character of its first Form, which it can easily resume in all the ordinary Preparations, and that it is good to divest it as much as possible, at least, as much as is necessary, that the Mercury may not be revived in the Body.

Fourthly, That for this reason, the Mercury must be given in as small a quantity as possible, and it is to be observed, that when Friction is allowable, as it is in Persons of a good Constitution, there does very little Mercury enter into the Body, although the Unguent does contain much of it; and it is so far thus to be presumed, that there are some judicious Persons who have maintained an Opinion, that in this case, nothing but the single Vapour of the Mercury does enter into the Body, and if one had the Cu-

riosity to gather the Mercury that remains in the Linnen, there would be the same Weight found, that was put in the Unguent at the first.

Fifthly, That although the Mercury be made fit to go to the Head, and raise a Salivation; yet this Salivation shall do no good, if it be not performed by such a Motion as is called Critical; that is to say, that the Venereal Matter must be separated from the Mass of Blood, that it must be conveyed out of the Body by the most convenient Passages, which will not happen, if the Mercury be not a double Mercury, which may exert its Activity from all Quarters, and be distributed through the whole Body, in conformity to the Motion of the Blood, that it may be in a Capacity to seize upon the Venereal Ferment in all the parts of the Body; and therefore we must think it to be much better, if we could join it inseparably by way of Fermentation, to some domestick Spirit, that is well acquainted with the Affairs of the House, to conduct it through all those Stages.

Sixthly, When this is once effectually performed, we shall only have a Medicine which will be more proper for Transpiration than for Salivation: And therefore there must be an Assistant that is no Stranger to this Kind, which must be made fit to produce all these necessary Motions.

Ignorant Persons may imagine that I talk to be seen, and not to be understood; but Men of Reason, who by Study and Industry, do in some measure know the Nature of the Subject about which I Treat, will understand me at the first Reading, and do me the Right to declare in my Favour, that it is not possible for me to explain more clearly and faithfully, the preparation of a Medicine of this Importance.

And for such Persons it is, that I have written this Treatise; 'tis just, that they receive the Benefit of it, and that, in the meantime will invite others, by their Example to Industry and Study. *Qui nucleum ex nucis vult excorticat nucem*, i. e. He that would have the Kernel must crack the Shell. I further declare, that neither Ambition nor

Covetousness moved me hereunto. What I offer has a Foundation in Reason, which assisted me in the finding of it, and this Reason is seconded by a very fortunate Experience.

By this means we may cure the most inveterate Pox; I have already excepted that Degree of it, where there is a Caries of the Bones of the Nose or Skull. Yet we may reasonably think it sufficient. Nevertheless, from the time that I first discovered this Anti-venereal Medicine, although I have cured a great number of those who had the Venereal Distemper, I have not yet had enough of such Persons, who had their Bones so very much Putrified, as to afford me an Occasion of establishing by Experience, an absolute Assurance of the Thing. Nobody, in these Days, does suffer, himself to be eaten to the Bones by the Venereal Distemper, they look to it, in some reasonable time, without exposing themselves to the Fatality of the last Degree, but because I have formerly seen many, even of this sort, who could not be cured, either by Mercurial Pills or Friction, which were given them with no small Rigour; I have, with good Success, used on the like Occasions, a Fumigation or Vapour, with Turpentine or Balsam of *Pern*, the Crust of Bread in Powder, and a little Mercury, and thereby raised a happy Salivation, proceeding gently at the first. Yet this Method is not absolutely without Danger, although Mr. *Sylvius de Leboe* has said of it, that the Fumigation is the safest Way; it is easy, by making the least Observation, to be of a contrary Mind, and I shall demonstratively prove, that this Remedy cannot cure all sorts of Pox, and if another way can be found for curing the Caries of the Bones, I would not advise any one to use this; but seeing this Method is not used in this Country, and there are very few who know how to practise it, I shall no longer insist on it.

I do not here prescribe any particular Method for Infants, because I know they may be very well cured without Salivation, by the only use of Sublimate, or in all Cases, by that of the Golden Precipitate.

Neither do I particularly consider as yet, the Case of Women, who have irregular

Courses, because we know by Experience, that the Remedy I have given does infallibly provoke the *Menstrua*, and that it does not in the least divert Salivation: We have also observed, that the same Remedy does provoke the Hemorrhoids in Men, who are subject to them, without diverting Salivation.

And upon this Account, it ought not to be given to Women with Child, for fear of an Abortion; but the Solar Precipitate is to be used, and that with great Moderation and Prudence, and in case the Cure cannot be completed before she is brought to Bed, by reason of her being near her Time, which will hinder the Continuance of the Remedy, it may be conveniently done afterwards, and in giving it to the Mother, the Child will be cured at the same time, if some Grains of the Volatile Salt of Vipers be given to it from time to time. Or the Mother may be salivated in that Case, if the Physician pleases.

There is no need of a separate Chapter for a Description of the Medicines that may correct the ill Accidents that frequently follow upon Salivation, that is made by the mercurial Unguent which, to speak the Truth, are so Dreadful, that they are enough to strike us with Horror, when we read them in Authors. You may judge how intolerable they are to the Patients, and what a Tragedy they are to the Spectators: For if the Medicine be well ordered, there will no ill Accident ensue, there needs only a common Gargarism to qualify the Ulcers of the Mouth, yet this is not to be used too often, unless there be an Hemorrhagy, lest the Ulcers be closed up too soon, and so the Salivation have not a due time for its Continuance, which ordinarily, is at the least fifteen, sixteen, or twenty Days, or at the most thirty Days, which happens very seldom, unless when it is thought necessary to be entertained so long.

Of the Chancre.

I speak not here of Chancres that are the Accidents of the Venereal Distemper, because these are cured by the same Remedy, that is proper for the Pox, but only of those that are the particular Pox, the Ferment of which

which has not been carried farther than the part which at first received it; and whereof we have spoken sufficiently in the preceding Chapters, with respect to the Theory; so that it is needless to repeat the same Thing. As for the Practice, I differ somewhat from some Authors whom I have seen, not from a Spirit of Contradiction towards any Person, but because I learned by Reason and Experience, that this sort of Chancres may be more successfully and easily Cured, otherwise than by the ordinary Methods.

They alledge that all Chancres of the right Sort, ought to be Cauterised, and then brought to Suppuration; and for this purpose, they make use of Red Precipitate, of *Lapis Infernalis*, or the common Caustick, or Sublimate Corrosive, and they cicatrize the Chancre with a Suppurative, after that they use the ordinary Remedies, and in the mean time they Purge the Patient frequently with Mercury, for the depuration of his Blood, because they suppose, that it would be very extraordinary for the Chancre to remain in a Part, for any long time, without transmitting insensibly some Particles of the Venereal Ferment into the Mass of Blood, which may produce the Universal Pox, if it be neglected, and besides that, those who use the greatest Precaution, give Diaphoreticks to the Patient, after those Remedies. All this is attended with an insupportable Pain, and unspeakable trouble to the Person, besides the unreasonable time which it requires. I am confident, that if *Vigo's* Plaster, with a little *Mercurius Precipitatus Dulcis* be applied to the Patient, and if some Doses of the Solar Precipitate be given to him; the most inveterate Chancre shall be safely Cured without Pain, without Trouble, and in a little Time.

If there be a *Phymosis*, or a *Paraphymosis*, (that is to say, the former, when the Glans is so enclosed within the Prepuce, that it cannot be uncovered, or the latter, when it is so uncovered that it cannot be again covered) but the latter, especially, being attended with an Inflammation and a Pain; the same Solar Precipitate, after once Bleeding, is an effectual Remedy.

Of the Heat of Urine and the Virulent Gonorrhæa.

It would require a Book by it self to treat of this kind of Pox exactly; yet all sorts of Persons meddle with it, and there are those who pretend that they can easily Cure it with Water and Sugar; others with a bare Royal Ptilan, which is to be taken every Day, till the Cure be Completed; a third sort, with the Salt Polychrest or Chrystal Mineral; in a Word, every one does flatter himself with the Fancy that he has found an excellent and easie Method for curing this Disease.

Yet they who are most Conversant about those things, and who are to be Credited, are obliged to acknowledge, that if there are sometimes Heats of Urine that may be easily Cured, there is also a great number of others which are hard enough to be Cured; and that oftentimes the great Disease might be more easily Cured than any Venereal Heat of Urine whatsoever, especially, if it be not well look'd to at the beginning, and if the specifick Remedies be neglected, or ill administr'd.

I have seen no approved Treatise of this Subject, but what does give Rules that are to be observed, for a good Cure. And therefore, I shall not here particularly treat of them. Yet I hope, within some time, to give some singular Observations upon this Subject, which I would have willingly done in this Impression, if they had been ready for a Publication.

Yet that this Treatise may not be altogether Defective, I shall here lay down a Method of Practice for ordinary Occasions.

I do not repeat what I have said in the fourth Chapter, touching the Theory of this Particular Pox: For although I did not very much enlarge upon it, you may there find that which is necessary for the Knowledge of it's Nature, and the manner of it's Production.

First, If the Person be of a very hot Temper, and Plethorick, and the Pain, and heat of Urine considerable, there is no danger in Bleeding him, and repeating it as often as it shall be thought Necessary; the Blood must be

be taken in the Arm, to make a true Revolution, and not in the Foot, which would draw the Humours more upon the Part.

They were formerly very scrupulous to let Blood, and especially, in the Arm, because they believed, that that might attract the Virulency into the Mass of Blood, and thereby occasion the Great Pox, but they were undeceived, after they saw both Reason and Experience do manifestly justify Phlebotomy. The circulation of the Blood does plainly shew, that if there were any danger in letting of Blood, the practice would be as dangerous in the Foot as in the Arm; and experience shews, that bleeding in the Arm does so much contribute to the Cure, that it is the means of preventing the Pox, because it cools and suppresses the Inflammation, and thereby hinders the progress of the Venereal Ferment, it disburdens the Sanguinary Vessels, and so makes way for Purgatives and Diureticks to operate with tients the greater Efficacy.

Yet I do not alledge, that all sorts of Paught to bleed, but only those who are Hot, Sanguine and Plethorick.

I Advise withal that the Virulency be not Neglected, and that the specifick Remedy, which is *Mercurius Dulcis*, be not forgotten, which is sufficient for this Disease, if it be given with convenient Purgatives, as *Cassia*, fine *Catholicon*, or Confection of Hamech, and repeated from time to time, as necessity shall require.

Nevertheless this Remedy will be ineffectual, or very slow on some Occasions, as when the hot Urine is Roapy, which happens when the Inflammation is very great, and the Patient suffers great Pains, that cause a Convulsion in the Nerves of the Yard, which by dilating themselves in their Breadth, do retire toward their Original, and so make the Yard Crooked or Twisted; in this case it will be found, that one Dose of the Solar Precipitate seasonably given, will be a very safe and effectual Expedient.

In the mean time, care is to be taken, that the Patient may be Cooled, which is one of the first things to be done, and 'tis to be remembered, that if he be heated from the beginning, by a Purgative, the Malady becomes thereby very Rebellious, and the

Symptoms are exceedingly encreased; or the virulent Matter shall be thrown upon the Stones: Emulsions are the best means that can be used for cooling, after which, if it be thought Convenient, there may be given some very cooling Ptsan for Example, of whole Barley, the Roots of Water-lilly, Sorrel, Marsh-mallows, and of Liquorice, Linseed, the cold Seeds, white Poppy Seed, and some Lemmon Juice, all boiled together in a proportionable quantity of Water, which must be always a great deal, because the Patient must drink as much of the Ptsan as his Stomach can bear.

When the accidents disappear, so that the virulency is mitigated by the means of *Mercurius Dulcis*, that the running is not so great, and becomes pretty White, if an Ulcer be thought to be in those Parts that are the Seat of the *Gonorrhœa*, there must be put in the Ptsan a little of the Salt of Polychrest, or Crystal Mineral, or which is much better, the fixed Salt Armoniac, which is a gentle and powerful Diuretick for cleansing Ulcers, after which, to consolidate the Part, there must be given, for some Mornings, in a little Wine, twelve or fifteen drops of a mixture made by Distillation, of two parts of the Balsam of Peru, one part of the Ethereal Spirit of Turpentine. Or, This following preparation of Antimony may be used, which is a good Remedy for drying an Ulcer; it stops the running of Matter, gently and insensibly, and also expels the remainder of the virulent Matter, by Sweat, when it has not been sufficiently taken off by preceding Medicines.

Take equal parts of good Antimony, and of Harts-horn calcined to a Whiteness, mix these two substances very well upon Marble, put the mixture in an open Earthen Vessel, set it in a Wind-Furnace, you shall calcine them, by stirring the Matter continually with an Iron Spatula, till the Smoak thereof be well over; after which the whole is to be put into a Crucible, with a large Bottom; calcine them therein over a great Fire, for the space of two Hours; you shall have a Powder, white as Snow, and which for some great and peculiar Advantages, is preferable to the vulgar Diaporetick Antimony; which will be manifest by Experience:

ence: The Dose is half a Dram, with the conserve of Roses, or any other Conserve, or Water of the like Nature, as you please.

No injections are to be used, if they may be avoided, but sometimes we are at last obliged to use them, and that we may have one that is proper and safe, this is to be made use of.

Take a Handful of Horse-tail, as much of red Roses, and five or six Flowers of a Pomegranate, or their peeling in Proportion. Let all be boiled in three Pints of Claret, Wine of a good Body, to the diminution of the Half, then strain it through a Linnen-cloth to free it from the grosser Parts, and make an injection with it three or four times a Day.

All these Remedies will be unprofitable, if the Patient does not observe good Rules for governing himself, he must be Continent, use no violent Exercise (especially what may prove troublesome to the Reins, such as much Walking, Riding) avoid Drinking of Wine, Sauces, Play, Watching, and the like.

Of a Bubo or Poulain.

The manner how a Venereal Bubo or Poulain is produced, has been spoken of in the fourth Chapter, we need only add here, that seeing the Poulain is produced in a critical manner, it is not to be imagined, that it is a perfect Crisis; and when such a Tumour does appear in the Groin, which makes a Poulain, although the Venereal Matter of that Poulain has been separated from the Mass of Blood, and the Blood is entirely cleansed from it, yet there does always remain a great deal more, and even when the Poulain does suppurate very well, there is some time required, before the Mass of Blood can be freed; and possibly this will never happen, unless there be great care taken, both to draw forth the Matter by external Remedies, as by Cupping-Glasses, and Vescicatory Plaisters, and likewise to give frequent and strong Purges by Specificks; besides a Sudorifick Diet, which some Prescribe, the better to consume the Venereal Ferment, with which the whole Blood is infected.

And upon this account we ought to look upon this sort of Pox, not as particular, but Universal, because the Virulency thereof does reside in, and it is upon this ground, that I am of Opinion, that it does require the same Remedy. I further affirm, that by that means, it shall not only be cured with all imaginable Assurance, but likewise in a much less time, then according to ordinary Method.

To understand this well, we need only observe, that two or three Months time is oftentimes requisite for perfecting the Cure of a Poulain. When it begins to appear, they apply Cupping-Glasses to it, to draw the Matter outwards, and stay it in that Part, which puts the Patient to a great deal of Pain; after which, they apply very attractive Plaisters or Cataplasms, and very frequently it is a Month before that Bubo come to a State of Suppuration, especially in those who are of a cold and melancholy Temper; for in those that are Sanguine it does suppurate more easily: When the purulent Matter is of some Maturity, they open the Bubo with a Lance or Cauter, and dress it as they do other Tumours, till the Suppuration be over, which is of a very long Continuance: In the mean time they purge the Patient frequently with Mercurial Pills they confine him to a Diet-drink and after all, there are some who make him Sweat a little, or empty him by Diureticks.

If the Solar Precipitate be used every third Day, and *Vigo's* Plaister with Mercury, be applied to the Bubo; Poulains shall be cured without Danger, if what we said in the eighth Chapter be observed, where we spoke of the Golden Precipitate.

By this Method you will find that Poulains are resolved, and the consequences are not to be feared, because, according to the Precautions that we have laid down, the Blood is so well depurated, that there remains no Venereal Ferment; and no Man can upon any good ground oppose this Method, because, it may be often observed, that Poulains do disappear, (what ever may be pretended) after all kinds of Suppuratives have been essay'd, and the Patient has endured a long Fatigue. And therefore, there is a necessity, to use the same Methods as in

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the great Distemper, or, if it be not done in that time, those who differ from me, are constrained to use this way, when they see the ordinary signs of the Pox appear. Those who have Poulains, know very well that what I say, is true, and if they would be at the Pains to reflect on their own Method, if they would take a view of the Sick whom they have not recovered, or have cruelly Tortured, and if they were disposed to quit the Prejudices with which they are Blinded, they would quickly embrace what I propose, seeing it is a more certain, gentle and short way.

But if a Poulain comes to suppurate of it self; it would, in this case be very Foolish, to drive the Venereal Matter into the Body, to evacuate it by Stool, or any other way than by the Part it self; which ought to be Cauterized or Launced, without expecting any thing but the Maturation of the Abscess it self. The Matter must be let alone, to run so long as it can of it self, by keeping in the Passage a Tent of Lint only, and the like upon the Plaister which we have mentioned, and in the mean time, the other Remedies, of which we have spoken are to be given, as if the Bubo had not been opened.

I declare, it is very much to be wished that Buboes did suppurate of themselves, and also, that if instead of the drawing Plaister, the Matter could be so ordered that all the Venereal Matter, with which the Mass of Blood is Infected, might be evacuated through the Passage that is made after Suppuration; the Sick would receive some Comfort, under the extraordinary Pain which they suffer, and the wearisom time that is taken for the Cure: But to suffer

much, to be Patient beyond Patience, and to take an extraordinary number of troublesome Medicines, all this, I say, is sufficient to open the Eyes of those who are most Stupid, and oblige them to consider what I propose to them.

I know very well, that it is a matter of some Difficulty, for those who have been prevented with a contrary Method, to accommodate themselves to this: Reason, how Pregnant soever it may be in it self, has ordinarily no power over those who are not in a Condition to use it themselves, or (if they be) are engaged by their Interest, not to change; the continuance of the Disease, a great number of Cataplasms, Pills, Ptisans maintain the Trade of not a few in the World, and are valuable enough to purchase some Lucre, which is fairly advanced by the Pains that the Sick endure, who being ignorant of the Nature of the Disease, do never think it great but when the Pain is great, and when the cure takes a long time: Nevertheless, because there are some able Men in all Places, who hearken to Reason, and who are so laudably disposed, that they suffer themselves to be convinced, I hope, that there may be some one of such found, who will grant me one thing at least, which is to examine impartially what I offer; and when he shall find what I affirm is not contrary to Reason; it must also be enquired, if experience does agree with Reason; by this means he will judge rightly, and if there be any cause for it, he may give me the Eye, but I have no reason to be afraid of the Charge, because, before I offered any thing to the World, I did three things, I reason'd, I practis'd, and frequently reflected on my own Experience.

Of the Gonorrhœa both in Men and Women : From Michael Torres, Drake, &c.

Of a Gonorrhœa in General, both Virulent and Simple in Men.

I Shall speak of each of these *Gonorrhœa's* apart, and first of the Virulent one, which is a malignant Distemper, communicated, or a Contagion gotten by Coition, with an impure Companion, and is widely different from a Simple *Gonorrhœa*, as I shall shew by and by. When a Man has gotten a *Gonorrhœa* or *Clap* it increases in strength continually, and each Days neglect gives the Malignity Opportunity of exerting and spreading it's self, till the Disease from a particular one hath proceeded to infect the whole Mass of Blood, and becomes Universal. The Symptoms of a Venereal *Gonorrhœa* are a painful heat in making Water, which by the French is call'd *Chande Pisse*, and which they distinguish as a particular *Gonorrhœa*, yet is only a Symptom of a Venereal one, as are also the involuntary and painful Erections, and a running of a corrosive Matter of a greenish Colour, with often an Inflammation of the Yard, which makes the Patient look Megre and Thin, also a small Itching at the beginning of the *Glans* or Head of the Penis just at the entrance of the *Urethra*, or Passage of Urine, which continues before any thing else appears, sometimes one, two or three Days, after which a Running shews it self as above said, either Yellow or Greenish, and the Urine seems Hot and Pricking, which increases till the Patient seems to have a Strangury, which prompts him to the act of Copulation, when the Acrimony of this Malignity is increased, and the Ulcer formed, he is scarce warm in his Bed before he hath an involuntary Erection, and that very Painful, being what the French call a

Chordee, because the head of the *Penis* stands Bent, and seems as if it was drawn downwards by a Cord or String. The Testicles are likewise sometimes very much swell'd, and that either by the Misapplication of those, who have the Patient in Hand, or by some violent Exercises, as Riding too much, Jumping or the like; sometimes also *Buboes* arise in one or both *Groins*, by the Matter which Runs, being propelled into the Glands there, likewise sometimes there happens a *Phymosis*, when a Man is *Clap'd*, which is such a Contraction of the *Præputium* or Fore-skin, that the Nut is strangulated, the Contraction being sometimes so very much straitned and wrenched up behind the Ring of the Nutt, as to cause it to swell, so that it cannot be brought over to cover the *Glans* or *Nutt*, and sometimes there is a *Paraphymosis*, which is the reverse of the Former, and is such a straitness over all the *Glans* or *Nutt*, as that the *Præputium* cannot be slip'd back to uncover the *Nutt*, nay sometimes not to be extended so much as to show the very end of the Nutt, or entrance into the *Urethra*, or Passage of Urine, and his shutting up or inclosing of the Nutt, keeps in the Acrimonious Humour between them, which Corrodes both *Præpuce* and *Glans*, and causes Pain, Inflammation, Fluxion, and perhaps *Gangrene*, which oftentimes also are the Consequences of a *Phymosis*. Thus having spoken as much concerning a virulent *Gonorrhœa* or *Clap*, as is necessary for any Man to know whether he has such an accident or not, I shall proceed to say something of that which we call a Simple *Gonorrhœa*, that none may be imposed upon by any Mercenary Practitioner, to the Detriment of their Health, who may with design tell them it is one when it is the other.

A *Simple Gonorrhœa* then; is an involuntary Effusion of Seed only, either *Crude* or well Digested, proceeding from a Relaxation of the Seminal Vessels, either by means of a super-abundant quantity of Seed, and that Hot and Acrimonious, or through the Weakness or ill Constitution of the Patient, or through some external Accident, as Bruises on the Privities, Wrenches, Strains, carrying heavy Burdens, or the like; appearing quite different to the Venereal Symptoms aforementioned, and is to be cured by the Exhibition only of the moderate astringent corroborative Remedies, though too often this and the Malignant one are confounded, and cures alike attempted by the Ignorant, I knew a Young Man, who upon stepping over the side of one Ship to another, in order to be set Ashore, by the

Motion of the Ship step'd so far, that he fell Astride, on the side or edge of the Ship, and greatly bruised himself on the Testicles and Perineum, upon which great Pain and Inflammation ensued, which brought on heat of Urine, pain upon Erection, and a white after a Running at the *Penis*, appeared as if he had been *Clap'd*; a Surgeon being sent for, made such Applications as he conceived necessary, but when he saw the Running, and had had complaints repeated of heat of Urine, &c. He taxed him with being *Clap'd*, which though the Young Man denied; yet the Surgeon would not believe, but treated him as such, to almost his inevitable Ruin, had not his Friends sent for another, who upon mild attemperating and astringent Medicines recover'd him,

Of a Gonorrhœa in General both Virulent and Simple in Women, which latter is called the Whites.

WOMEN are subject also both to the Virulent and *Simple Gonorrhœa*, the latter of which is called the *Fluor Albus* or the matter of the virulent one, is like that in Men, and flows continually, and without Intermision as theirs do, and is Yellowish or Greenish, Graveolent, Sharp and Corrosive, and is generally attended with little Ulcers on the Labia of the *Pudendum*; but these Symptoms alone are not always to be rely'd on, for there is besides, this remarkable difference, which (if carefully heeded by those that have any cause to suspect themselves,) will not deceive them, and that in the Virulent *Gonorrhœa* does not cease running at the time they have the *Menses*, when the *Fluor Albus* always ceases Running, and returns a little time after they are gone, Women who are *Clap'd*, are freed from several of those Symptoms which attend Men, and by which chiefly we make our Judgment of the Disease, as particularly to the Urine, which in Women is not alter'd as it is in Men, neither does it seem to have more than the usual Warmth, unless where the parts of the *Labia*, which the

Urine wets in making, are Excoriated or Exulcerated; the *Chordee* likewise, which most Men that have a Virulent *Clap*, are vex'd with, are very seldom observed in Women; indeed where the *Clap* is very Virulent, and has been neglected or ill treated, the *Clitoris* may be inflam'd and irritated so as to cause a distorted Erection, which may be Painful; but that is a Symptom but seldom, the Womens Testicles also, or rather *Ovaria* lie, at too great a Distance to be affected with Humours, as we frequently see in Men; but they are liable to a *Phimosis*, but a *Paraphymosis* entirely exempted from, the first being an Humour of the Orifice of the Vagina obstructing the Introduction of the *Penis*, which if not rectify'd in time, inflames, and Ulcers are form'd with a Defluxion of Humours on the Part, which are dangerous if neglected.

It does not always follow that every Woman that *Claps* a Man, is actually her self *Clap'd*, because it is possible that an infected Man may have left some of the Virulent Matter in the Vagina of the Woman, which being retain'd in it's wrinkles the next vigorous

gorous Gallant, may be so kind to take it from her in the Act, to his own Detriment and her Ease, or at leastwise but part of it, and so they may be sharers in the Infection, the possibility of being infected, not depending so much on the Quantity of the Malignant Matter inhibited, as on the Virulency or Corrosiveness of it. Hence I believe had that vulgar Error among Men, its rise, who alledge that when a Man is *Clap'd*, he frees himself, or at least lessens his Malady, by immediately after, lying with a sound Woman, and also an infected Woman with a sound Man, when in reality every Venereal act increases the Distemper, nay every Erection, if we consider the Seat of the Disease to be in the *Urethra*, as I shall by and by demonstrate, aggravates the Malady, by distending the *Urethra*, and consequently enlarging the Ulcer, whereby the Malignity the deeper insinuates it self; or if the Virulency be taken off, and what running remains be only from a Weakness of the Parts, those Erections hinder it's healing by interrupting Nature, in filling up the Ulcer with sound Flesh, in order to be cicatriz'd by the Nutritious Juice sent thither for that purpose.

The *Simple Gonorrhœa* in Women, or rather the *Flux Albus*, or as vulgarly call'd the *Whites*, proceeds only as in Men, from a Weakness or Relaxation of those Glands, which are design'd by Nature to separate a Mucous Juice for the Lubrication of the

Vagina, which the Ancients Erroneously call'd Seed. It is sometimes thin and whitish like Whey, sometimes of a pale Citron Colour, Gray, or Greenish, without any Smell, and is sometimes so Acrid and Hot, (which makes many Women believe and will not be perswaded, but it is Virulent) as to Corrode and Exulcerate the *Labia*, as they are bedew'd with it, and in some Women, causes such a violent Itching, as not to be born without hard Rubbing or Scratching, and this is when the sharp Humours of the whole Body are sent down thither, as the common Sink, to be discharg'd, which then usually colours the Running Blackish, and sometimes Fœtid, which the more confirms them it is Malignant, as many have come to me, and would not be beat out of it, but it was so; one Lady that I cur'd but a few Months since was under the dismal Apprehensions of having the Venereal Distemper, because of such a Running, which at length she was convinc'd to the contrary of, notwithstanding she had such an intolerable Itching, and Soreness in the *Labia*, that she could not rest a Nights, with pain in the Back, Weakness and Lassitude, by the ill Disposition of her Body, and great Flux of the *Whites*, which if she had been treated for, as what she imagin'd it to be, it might as she was a Fat Lady, and full of Humours, have cost her Life.

Of the Seat of the Virulent and Simple Gonorrhœa in Man

THERE are almost as many Opinions, as to the Seat of a *Clap*, in each Sex, as there are writers on the Disease, but to quote them all, would be to swell this small Treatise to a great Volume, yet it is necessary to mention in general terms the Disagreement, there is amongst them as to this particular, because some that practise may see the Reason of their unsuccessfulness in such Patients, and why it is that such numbers of People are left with incurable *Gleets*, though under the care of other-

wise ingenious Men, and indeed it is the greater boldness in those (as there are many) who undertake Patients in this Kind, when they know no more of the Seat of the Malady, and consequently can give no more Reason for what they administer for Cure, than that they have seen and known some Methods used by others with Success, when alas! Such have never made them acquainted how many they have disappointed in their Cures, to one tolerably set to Rights.

Some of the Ancients say, both Virulent and Simple *Gonorrhæa's* proceed only from a Corruption of Seminal Matter, and that the Seminal Vessels are only affected. Others say that in a Venereal *Gonorrhæa*, the tone of the Testicles is depraved, by which the Seed is Vitiated; and that when there follows a *Gleet* that is inveterate, the *Parastata* are sometimes Ulcerated, or at leastwise greatly Debilitated. Others say that in a *Clap* the *Parastata* are Ulcerated and that what flows is Seed, together with the Virulent Pus. Others, and those some of the latest, say, that all Runnings in Men have their Original from the *Prostate Glands*. Others again say that the *Prostate Glands*, Seminal Vessels, and Testicles, are all three alike concerned, and that from an imbecility of those several Parts, occasioned from a Malignant Virus, the running is produced, which becomes Fœtid and Putrify'd, thus *quot homines tot sententiae*, and thus do we see the endeavours of Men, some of which were great in their time, to fix the Seat of a Virulent *Gonorrhæa* on this or that Part or Parts, which in good truth have no relation hereunto, and consequently no ways concern'd therein; where then will it be ask'd is the true Seat of a *Clap* in Men? In answer to which I affirm it to be in the *Urethra*, or Passage of Urine, not that it is confined to the very same part of it, but may be fixed sometimes in one, and sometimes in another part of that Membrane, it sometimes, and to some People happens within an Inch or less of the Extremity of the Passage, at other times, and to other People, it may be in the middle of it, at other times at the further end, but never in the *Prostate Glands*, Seminal Vessels or *Parastata*, but to the contrary is found upon Dissections to be as I said before, but for the most part on the Mouths of the *Glandula Mucosa*, or near them in the *Urethra*, as some of our latest and best Anatomists confirm, and not on the Parts the Ancients, and some of the Moderns after them, imagine, convey'd thither by the penetration of the subtil *Virus*, through the Pores of the *Glans* or *Nut* of the *Penis* in the time of Copulation, which cannot be if the Nature of that Malignity, and texture of the

Parts, through which they imagine it to pass, be rightly understood, for there is not so much as one Vein to lead the Venom from the *Glans* to any of those Parts, if there was, and that the poisonous Humour could pass, the infection would not appear in a *Gonorrhæa*, but in the Pox it self, and after such a manner, would the Patient be infected in the beginning. And that this is so, is demonstrable by the *Glans* and *Prepuce*, being beset with Shankers, or *Ulcuscula*, as we frequently see upon impure Copulation, when any of the Venereal Matter happens to fix on those Parts, which do not affect the Blood, or so much as get into the *Urethra*, to procure a Running, but there remain, and are easily to be removed, and the Patient at once Cured, without any internal Medicine, unless they be neglected or not rightly manag'd, which then insinuate by degrees into the Pores of the Skin, and corrode by its sharp Particles, the tender Fibrils of those thin Membranes, but even then do not pass into the Blood-vessels, till they have form'd a deep Ulcer, which then assuredly Poxes the Patient, so that if it gets next to the Blood-vessels, to be whirl'd about the Body, a Man can never be said to be Pox'd.

It is very Apparent, that the Seat of inveterate *Gleets*, is also from Venereal *Ulcers* on the *Glands* in the *Urethra* not Cicatrized; and the Reason that the common Methods of Cure, so often frustrate the Expectations of both the Practitioner and the Patient. But for the Simple *Gonorrhæa*, the Seat of that as I said before is in the Seminal Vessels, by means of their being relax'd by either a Flux of Acrimonious Humours upon them, or by Falls, Bruises, or the like, which however, and *Gleets*, being confounded together as from one Cause, and seated in the same Place or Places, by Authors, is the Reason why so many People are ruined by the Applications made, which indeed are so preposterous as would make a Man of any Understanding both admire and blush at.

But though the Malignity in *Claps* enters the *Urethra*, and there instantly fixes it self on the *Glandula Muscosa* after the Semen *Humayum* is ejected through it; yet I cannot

not but allow that by some extraordinary Accidens the Virulent Matter, may fix it self on the Valves of the Caruncles, which are placed at the opening of the Ducts of the Prostatæ; yet take this by the way, I do not allow that therefore it may be fixed in the Prostatæ themselves; no, for they lying at some distance from those Caruncles, the Malignant Humours must have form'd a very large Ulcer, before it come to them, and must have gotten into the Blood long before, and by that Rule the most distant parts of the Body may be equally Infected; for those Valves, though they will suffer the Liquor, which they separate, to pass through them as Mercury or Quicksilver is strained through Leather, yet will they not admit any Liquor to pass through those Tubes into the Prostatæ back again: Or supposing, as some will have it, that the Malignity in a Clap is fix'd at the Valves of the *Vesicula Seminales* themselves, till the Disease hath proceeded first to a Pox, and these *Vesicula Seminales* become infected a *Posteriori*, which I grant may be, even to the Corroding and Ulcerating those Valves quite off, whence proceeds constant involuntary effusion of pure Seed, which brings on a dorsal Tabes or Consumption of the Back, which cannot be cured but by Castration, and by that but seldom, and without never. Or supposing as others Assert, that the Malignity in a Clap, takes up its Resistance in the *Parastatæ*; yet as they lie still at a greater distance from the Urethra, than either the *Prostatæ* or *Vesicula Seminales*, the Malignity to come at them, must not only pass by the Urethra, through the *Valves*, into the *Vesicula Seminales*, (which is directly contrary to the action of those *Valves*,) but it must likewise take a long course through them, and the *Vas differens*, before it can possibly come at the *Parastatæ*, and why it should so besriend the *proximate* Parts it passes through, to fix it self on those remote Parts is a *Phænomena* I am not able to Solve. Or supposing, as spoken before, that it is possible for the Virulent Humour to pass through the Pores of the *Glans*, or *Nut* of the *Penis*, in the time of Copulation; yet then the *Parastatæ* cannot be affected by it, till the whole Mass of Blood is, and when that

is Infected, the whole Body is so; but as I have already said, there is not one *Vein* near the *Glans*, to convey it into the Blood; so no such Infection can be.

To sum up all then, it is I think made plain, that the Seat of a Venereal *Gonorrhœa* or Clap in Men, is not in any of those parts assigned to it by the *Antients*, and some of the *Moderns* treading in their Steps, but in the Urethra or Passage of Urine, but that it may happen in any part of that, has been shewed, though it most commonly takes up its Residence, either in the *Ostiola* of the *Glandula Mucosa* or somewhere near them, but still in the Urethra or Passage of Urine. "These *Glandula Mucosa* are call'd
"so by the late Ingenious Mr. William Com-
"per the Surgeon, who first discover'd 'em,
"and are more particularly spoken to, by
"the Learned Doctor Drake, in his *Anthro-*
"*pologia Nova*, Pag. 262. 263. In these
"Words; They are says he three in Num-
"ber, the two first are about the bigness
"of a French-Bean, of a depressed oval Fi-
"gure, of a yellowish Colour like *Prostates*,
"and lie on each side of the Bulb of the
"cavernous Body of the Urethra a little a-
"bove it. Their excretory Ducts spring from
"their internal Surface, next the inner
"Membrane of the Urethra, whence de-
"scending about half an Inch, they be-
"gin to grow less, and piercing that Mem-
"brane obliquely, open into the Urethra by
"two distinct Orifices, just below its bend-
"ing, under the *Ossa Pubis* in *Perineo*,
"where they discharge a transparent *Vis-*
"*cons* Liquor. The third *Mucous Gland* is
"a small conglobate yellowish Gland like
"the former, but somewhat less, situated
"about the Angle of Flexure of the Urethra,
"under the *Ossa Pubis* in the *Perineum* near
"the *Anus*; and hath two excretory Ducts,
"which enter the Urethra obliquely, about
"a quarter of an Inch below the Orifices of
"the two former, and discharge a Liquor
"like theirs, both in Colour and Consist-
"ence.

Thus from this faithful and ingenious *Anatomical* Discovery and Description, and from what hath been said, it is plain that the true Seat of a Clap is where I have said, and

and likewise as plain that when it first appears and for a considerable time after, it is purely *Local*, that the Blood is untainted, and not in the least concern'd in it at that time, and that while it continues so, it may be heal'd as other common *Ulcers* are,

by external Applications only, which I shall further and yet more plainly make appear before I finish this Treatise, to the Satisfaction of all People, but such who resolve to shut their Eyes against the most convincing demonstrative Truths that are.

Of the Seat of the Virulent and Simple Gonorrhœa, or Whites in Women.

HAVING spoken large enough, to give all an insight into the Seat of a *Gonorrhœa* in Man, I now come to that in Women, but first it is proper to say something in particular, as to the Opinion of Authors concerning it, which they have taken as much Pains, though not altogether so differently, to fix as wrongfully in them, as in the Men, but the dispute on their side, not having been so much the business of Authors, as to Men; I shall not need to say so much about it. The Opinions of many Authors are, that the Seat of *Claps* in Women is in their *Testicles*, or rather *Ovaria*: Others, that it is in the *Cervix*, or *Vagina Uteri*, or *Neck* or *Sheath* of the Womb. Others again, that it is in the *Fundus* or bottom of the *Uterus* or Womb it self. But to clear the matter it will be necessary to speak to each of those Opinions apart, yet that cannot so properly be done, before the parts of *Generation* in a Woman be described, which I shall do, but yet as concise though plain as possible, brevity and perspicuity being what I all along intend. First, then I shall speak of the *Testicles*, or rather *Ovaria* of a Woman, which lie near two Fingers distance from the Womb, near the Terminations of the *Fallopian Tubes*, and are fastned to the Womb, by the *Vas differens* or strong Ligament, as also to other parts adjoining. These *Ovaria*, *Testicles*, or Stones in Women are not above half so big as those in Men, nor are they so Round, but more Flattish, differing also in Substance, being a Mass of little Bodies, or Eggs replete with a Substance Limpid and Transparent, like the white of a raw Egg, and which when boil'd, have the exact Similitude as they have. These little Eggs in Women, when

they are impregnated by the Spirit of the Seed in Man, conveyed to them through the *Tuba Fallopiana* before spoken of, which are *Ducts* about six Inches long that open into the Womb, and though the *Orifices* of them are very Small, they grow Large enough upon Coition, both to convey such a portion of the Seed cast into the Womb, to the *Ovaria*, to impregnate them, and suffer them when fecundated to come into the Womb to be form'd a Child, I say when it is so, a Woman may then be said to have conceived, therefore this is plain that the Seat of a Virulent *Gonorrhœa* in Women, is not in the *Testicles* or *Ovaria*, because the distance is so great as that the *Virulency* conveyed by the Man cannot be a *Gonorrhœa* or Running, because the *Tuba Fallopiana*, so contract themselves a little while afterwards, as not to admit any thing from them; but there might be a *Pox* indeed, which I believe few if any, have ever observed. Having plainly shewn why the Malignity of a *Clap* in Women has not its Seat in the *Testicles* or *Ovaria*, the same Reasons also shew, why it very seldom if ever takes up its Seat in the *Fundus Uteri*, or bottom of the Womb it self, though it is the Opinions of some very topping Authors, that it generally does, because of the quantity of the Running which Women discharge that are Clap'd, but the same Reasons I say that makes for one makes for the other, tho' I allow that in a vigorous Attack, and when the Woman takes a great pleasure in the Act, the Venereal Poison may be carried with the Seed so far as to the bottom of the Womb, and fix the Infection there as well as on any part of the *Vagina Uteri* or sheath of the Womb, where generally the Seat of Infection

tion is in most Women, those parts being very Lax, and all overspread with little *Mucous Glands*, whose *Tone* when hurt by the Venereal Poison, emits a Liquor, and with that a corrupt Humour, which constitute a *Gonorrhœa*, and is called a Running of the Reins or *Clap* in Women, and when the Malignity of that Infection is taken off by proper Medicines, what remains of a Run-

ning afterwards, as it does in very many Women, is what is call'd the Whites, few of them getting clear of such an Accident as a *Clap*, but that at last it degenerates into them, or at best are left in that Condition, their secret Parts being the sink of the Body, and so more liable to that troublesome grievance so common to the Sex.

Of the Operations perform'd on the Bladder, &c. From M. Dion; and of cutting for the Stone.

ONE of the greatest and most difficult Chirurgical Operations is the extraction of a Stone out of the Bladder: *Hypocrates* found it so Painful and Dangerous, that he resolv'd never to attempt it; and most Surgeons in our Days following the examples of the Ancients inhibit the performance of it, leaving the Execution thereof to those who make it their sole Business, and apply their utmost care to excel in it. The *Greeks* term'd these sort of Operators *Lithotomoi*, and we call them *Lithotomists*, from *Lithotomy*, which signifies in the Greek to cut the Stone: By *Lithotomy*, then we understand a Chirurgical Operation, by which we extract out of the Bladder, the Stones therein contained; and under the name of the Stones, we generally comprehend all exotick Bodies; as clots of Blood, Membranes, hardned Flesh, and whatever by their Mass, Bigness and Consistence, obstruct the course of the Urine, and oblige us to apply this Operation to clear the Organ.

When a Stone disengages it self from the Kidneys, and makes its way to the Bladder; if small it slides easily into that Purse, but if great, being obliged to dilate the *Ureter*, it occasions violent Pains, which are properly call'd *Nephritick* Pains, from the *Nephri* the Rein or Kidney.

I have told you that Stones pass through the *Ureters* from the Reins to the Bladder:

Those persons to whom this happens have their *Ureters* dilated in proportion to the Stones which pass through their Conduit, which not being generally larger than a Quill, is sometimes found extended to the bigness of a Thumb, and sometimes to the size of an Intestine; and though this part is capable of such an Extension, yet we meet with some instances of the Stones stopping in its Cavity: But these sorts of Stones remaining in the Kidneys or *Ureters* cannot be extracted by Surgery; therefore let us pass to them in the Bladder, which are the subject of our Operation.

Before we proceed to *Lithotomy*, 'tis requisite that we be satisfied that there is a Stone in the Bladder; the Signs which indicate to us are of two sorts. The first which we call common or equivocal, may depend on several Diseases of the Bladder, different from those caused by the Stone in the Bladder; the second styl'd Proper or Univocal, are such as are only peculiar to the Stone. The equivocal signs are very Numerous, the Patient is afflicted with a continual Pain in the Region of the Bladder, which is greater when he goes to make Water: Besides, when he strains there is a falling out of the Fundament; at other times the Patient feels a pressure on the *Perineum*, has involuntary Erections, produced by irritation of the *Ureter*, and difficulty of Urine: Now tho' all these Symptoms denote a Stone in the

Bladder they are not certain Signs; for they are also proper to Inflammations and Ulcers of the *Bladder* and *Urethra*, wherefore they are term'd Equivocal, and oblige us to have recourse to others which are Infallible; and these are the Finger and the Probe. The Surgeon then in Men puts his Finger up the *Anus* as far as he can, and there being only the thickness of the *Rectum*, and Bladder betwixt his Finger and the Stone, 'twill be easie for him to feel that exotick Body, especially holding the other Hand against the Region of the *Hypogastrium*, he pushes towards the *Rectum*, any thing whatever that may stick in the Bladder. In Women, the Matrix being placed betwixt the great Intestine and the Bladder, the Lithotomist cannot feel the Stone the same way as in Men; wherefore he must thrust his Finger into their *Vagina*: But in Virgins, for several Reasons which I pass over in Silence, he must not make use of his Finger, neither in the *Vagina*, nor in the *Rectum*, but must do it with his Probe.

'Tis not so easie to probe a Man as a Woman; the length and curve Finger of the *Urethra* in Men, are the Causes of the difficulty of introducing a Probe, to perform which Address and Practise are necessary. The Chirurgion then takes a Probe ten or eleven Inches long, and as big as a Writing Quill, generally made of Silver, half of its length being shap'd like a Crescent, and the other half straight. The end of the curve is half blunt, and the Extremity of that which is straight, provided with two Rings, in order to hold it faster. He oils his Probe, and prepares to introduce it into the Bladder, by thrusting the Curve part first into the *Urethra* or urinary Passage: But there being two ways of Probing, 'tis the Chirurgion's part to chuse that which he is most accustomed to practise; the one is, that of taking the Patient's Yard betwixt the Forefinger and Thumb of the left Hand, and mounting it upwards, whilst he holds the Probe in the same Finger and Thumb of the right Hand, in such manner that the concave Part of the Crescent is towards the Patient's Belly: Then having softly introduced its end into the *Urethra*, he thrusts it forwards 'till it reach the Root of the Yard,

when he lowers it, at that Instant, that its Point mounting upwards by passing below the *Os Pubis*, may proceed into the Bladder. The other way differs from the former, in the back of the Probe being turned towards the Patient's Belly, and that when 'tis thrust as far as the Root of the Yard, the Instrument must be half turned about, inclining it jointly with the Yard towards the right Groin, and afterwards lowering it; by which means its Point, pushed on by a small Impulse, will enter the Bladder: And this last way of probing is practised by almost all Lithotomists, who herein shew their Dexterity by this Master-piece of their Art. If when the Probe is ready to enter the Bladder, it meets with any Obstacle, it ought not at all to be forced forwards, because the Obstruction may be occasioned by a small Valve, termed the *Verumontanum*, which is the Place where the ejaculatory Vessels pierce the *Urethra*, and the least Violence offered, would not fail to hurt this Valve; wherefore the Probe must be withdrawn a Finger's breadth, in order to push it forwards again, and remove it from this Obstacle; and thus the Chirurgion finds his way into the Bladder.

The *Urethra* in Women being short and strait, 'tis not very difficult to introduce the Probe into it. The Patient being lain on her Back, with his left Hand the Chirurgion separates the *Nympha*, and discovers the Orifice of the *Urethra*, which is a small round Hole, situate between those two Tufts below the *Clitoris*. He then takes into his right Hand a Probe of the same bigness of that for Men, about six or seven Inches long, but straight, which having oiled, he gently introduces in the Bladder, and as well in Men as Women, turning the Probe to the Right and Left, if there be any Stone he will soon discover it, by the Resistance it will make to his Probe, and the audible Noise which the striking the end of it against that Body will occasion.

If by the Probe the Chirurgion is fully convinced that one or more Stones are in the Bladder, the sole way of extracting them is by Operation, which is performed one of the two ways which I shall shortly demonstrate to you; for 'tis a mistake to think that there

there are any Medicaments capable of dissolving a Stone in the Kidneys or Bladder. All the boasting Pretenders to the discovery of any such Remedies are Empyrics and Impostors, who taking advantage of the miserable Condition of the Patient, and his fearful Apprehensions of this Operation, promise more than they can perform. I don't blame a Patient endeavouring to avoid the Pain which that Performance must give him, nothing is so natural as to throw ones self into the Hands of those who offer us a certain and easie Cure: But these sort of People rather deserve Punishment, by reason their Promises are shocking to good Sense. There is no sort of Dissolvent, how vigorous soever it may be, that is able to dissolve a Stone out of the Bladder; and the Reason holds much stronger against the Possibility of finding any that should be strong enough to perform that Dissolution in the Bladder it self, after having passed through the different Conduits, which 'tis necessitated to run through to arrive there, supposing it taken at the Mouth. If strong enough to answer this end, what effects must it have on the Stomach, Intestines, lacteal Veins, Thoracick Channel in the Heart, Lungs, Arteries, Reins and Ureters; at all which parts it must touch before it reach the Bladder, the Residence of the Stone which they pretend to dissolve. And farther, if these Dissolvents are to be injected through the *Urethra*, will not the Urine hinder their Success, or will they not rather corrode the Bladder than the Stone?

'Tis then but a poor Refuge, to hope for a Cure by Medicaments; when the Stone is once formed, nothing but *Lithotomy* can draw it out of the Bladder: So that 'tis the Patient's part frankly to determine in favour of the Operation; and with utmost Expedition, dispose himself for it, when the Probe has convinc'd him, that all the Evils which he suffers are the Effects of a Stone in the Bladder; for the longer he defers it, the more the Stone increases, and the Performance of the Operation becomes the more Difficult and Painful. But if upon probing no Stone be found, and yet the Patient continues to feel the Accidents which it usually occasions, and particularly the Suppression of U-

rine, the most fatiguing of all of them, the Chirurgeon must relieve him as soon as the case will permit, either with regard to it as the Disease it self, or the Effect of another Distemper.

The Suppression of Urine is of such Importance, that 'tis scarce possible to retain ones Water above one Day, without being reduced to the last Extremity. When the Chirurgeon is come to the Patient, this Disease requires no Delay; for frequently, in these Cases, he is not sent for 'till the Patient has been long without voiding any Urine; and though never so little deferred, the Bladder yet fills more and more, the Pain and Danger Augment; for which Reason the Chirurgeon ought immediately to go to Work, for the Moments are highly valuable, and 'tis not in his Power to give a too expeditious Satisfaction to the Impatience of the Patient, who with most pressing Instances implores his Aid.

These Reasons have engaged us to shew the Methods of relieving the Suppression of Urine, before we demonstrate to you the Operation to be performed for the Extraction of the Stone. We must go first to the Patient, which is most in haste, for we lie under an indispensable Necessity of frequently voiding our Urine; but as for the Section, we are at Liberty to chuse the time, Season and Day, at Pleasure.

There are three sorts of Suppression of Urine, each of which is distinguished by its peculiar Name; the one of which is *Dysuria*, the other *Stranguria*, and the third *Ischuria*.

When a Patient does not void his Urine without Difficulty, this Indisposition is called *Dysuria*; which word is derived from *Dys*, which signifies difficult; and, *Ouron*, Urine, by reason its Passage is accompanied with Difficulty and Pain.

When the Patient pisses only drop by drop, this Disease is called *Stranguria* or *Strangury*, from *Stranx*, a Drop, and *Ouron*, Urine, because no more than a Drop comes at once; whence this Distemper is also called the Piss-dropping.

If the Urine doth not pass at all, 'tis an *Ischuria*, a Word derived from *Ischein*, to retain; and *Ouron*, Urine; it being

a total Retention and intire Suppression of Urine.

There are two sorts of Suppression of Urine; the one, when that Excrement is contained in the Bladder, and cannot issue out; and the other, when 'tis stopped above the Bladder.

We find five or six Causes which obstruct the Passage of the Urine out of the Bladder: First, when some Stone is placed at the Mouth of the *Urethra*, and stops that Passage; when it is to be pushed back with a Wax Candle, or a Probe, or displaced even by Extraction, if after several times removing the Patient, it still continues in the same place. Secondly, When the *Urethra* or urinary Passage is sunk, and as it were shrivel'd, as it happens to old Men, when the Erection of their Yard ceases: This is cured by hot and aromatick Fomentations which invigorate that Part. Thirdly, when an Inflammation happens to the Neck of the Bladder, or urinary Passage: In which case such Medicaments are applied as assuage the Pain, and moderate the Ardency of the Blood. Fourthly, when 'tis occasioned by a sluggish thick Flegm contained in the Bladder; that pituitous Matter is drawn out by the Probe. Fifthly, when the Bladder being too full, the Fibres, which extended to an excessive Degree, lose their springy Motion, and are no longer able, by Compression, to force out the Urine; this is what frequently happens to Children, after being long without Pissing: In this case the *Pubes* is to be rubbed with Oils, as that of Capers; and the Artist is also to have recourse to his Probe. To these is added a sixth Cause of the Retention of the Urine, which is said to be a *Carnosity*, which is to be Consumed; but I am not thoroughly convinced that there is any such thing.

We find two causes which hinder the Passage of the Urine into the Bladder: The first is a malignant and continual Fever, which, by its excessive Heat, so inflames the Parts, and especially the Kidneys, whose Pores are too closely locked up, or the Fibres too much Relaxed, or whose Ferments are ill disposed for the Separation of the excrementitious Serosity of the Blood; and the second is, when the Urine is detained above

the Bladder by Stones, either in the Reins or Ureters, which stop its Passage.

We discover the Suppression of Urine to be in the Bladder, by the Tumour, Pain and Tension which the Patient is sensible of in the Region of the *Pubes*; on the contrary, if this Liquor is suppressed above the Bladder, that Region is sunk in, soft, hollow and free from Pain; and when the Urine cannot be separated from the Blood, it becomes too watery, the Patient's Strength diminishes daily, and he dies.

The Judgment which the Chirurgion ought to pass on the suppressions of Urine, is, that those which detain the Urine in the Bladder by what Cause soever, may be cured; but those who keep it above the Bladder are very often Mortal, not affording any hope but from some Crisis which 'tis proper only for Nature to produce by an extraordinary Effort. Suppression of Urine in the Bladder is cured either by Medicaments, or Instruments.

The Medicaments are *Baths*, *Embrocations*, *Plaisters*, *Unctions*, *Humectations*, *Fomentations*; &c. applied to the Yard, *Pubes* or *Perrineum*, or introduced into the Bladder thro' the Yard. I shall not describe them here; a thousand Authors have treated of them.

The Cure, by the Assistance of Instruments is twofold, either Palliative or Curative, That call'd Palliative, is when we don't endeavour to remove the Cause, which continually remains, tho' we stop or relieve the Symptom; as when we only thrust back the Stone to give Passage to the Urine, it being sometimes possible for a Stone to continue forty Years in the Bladder. The Curative, is when we remove both the Disease and the Cause; as when the obstructive Humour and the Urine issue out by the Instrument which is introduced into the Organ.

This Operation is call'd *Catheterismus*, from the Instrument by which it is perform'd, which is term'd in Greek a *Catheter*, being deriv'd from *cata* within, and *ein* to send. 'Tis an excavated and curve Probe, which serves to draw the Urine out of the Bladder, and discover the Diseases of that Organ. The French call it *Algalie*, an Arabick Word commonly importing a Probe.

There are of these Probes adapted to both Sexes. One is of the largest Sort for Men; the other is lesser, in order to be used to Children; and the third is for Women. Those for Men are very much bent, to accommodate them to the Shape of the *Urethra*, and the Neck of the Bladder; and the other appointed for Women is almost straight, and shorter, because their *Urethra* or Urinary Passage is straighter and shorter than that of Men. The Chirurgion must be provided with both these Sorts. He dips the End in Oil, that it may enter with the greater Facility.

The Ancients made these Sorts of Probes of Horn; they were afterwards of Copper, but are all at present of Silver. They must be hollow quite thro', and their Cavity provided with a Pin or Stiletto: They must not be pierc'd at their Extremity which is introduc'd into the Bladder, but on the Sides of that End, because that in touching the Membranes of the Bladder by that End, if it was bor'd, they would stop it, and the Urine could not enter into the Probe; but being perforated on the Side, tho' the Probe should even touch the Bladder, the Urine may easily escape. They ought not to be so weak, as to be in Danger of bending; nor too big, for fear of occasioning Pain: They must be even and well polish'd, to enter with the greater Ease.

Tho' I here shew you but three Probes, the Chirurgion may yet provide himself with them of several Sizes, small ones for little Children, middling ones for Youths, and large ones for Men; but two Sorts are sufficient for Women, one small one for Girls, and a larger for those of a more advanced Age.

Here we should treat of the Introduction of the Probe into the Bladder, in order to draw off the Urine; but there being no Difference betwixt that and the Introduction of that Instrument to search whether there be any Stone, you need only remember what has been said on that Head.

The Probe being introduc'd into the Bladder, the Pin or Stiletto must be drawn out, in order to make way for the Urine to run thro' the Canal of the Probe. All the Urine being thus drawn off, the Probe must be

gently drawn out; and this Operation renew'd as often as the Patient wants to make Water, as long as the Suppression continues.

'Tis not always in the Chirurgion's Power to draw off the Urine by a Probe, because there are frequently Obstacles to the Introduction of that Instrument into the Bladder; and how dextrous soever he may be, he cannot get it into that Organ. *Lithotomists* themselves, notwithstanding their daily Practice of probing, have acknowledg'd their Inability of performing it in some Subjects, by reason of the insurmountable Hindrances which they find:

These Hindrances are either an Inflammation in the Neck of the Bladder and the *Prostata*, which so tumefies those Parts, that nothing can pass thro' the *Urethra*; or the Callosities of that Passage, caused by the cicatrizing of Ulcers, which so contract that Conduit, that 'tis impossible for the Probe to pass, whatever Efforts are made to force it in; or, lastly, some Tumours or membranous Productions which stop the *Urethra*, as it happens to some old Men, in whom the Passage so shrinks up, that neither the Urine nor Probe can open any Passage.

But, notwithstanding all this, the Patient must not be left to perish, and nothing but a Punction of the *Perinaeum* can save his Life; for he must of necessity void his Urine or dye: 'Tis then the Chirurgion's part to advertise the Patient's Relations and Friends, and give them such a Prognostication as the Nature of the Indisposition requires. After which, having disposed the *Apparatus*, he must place the Patient on the edge of the Bed, and lay him on his Back, his two Thighs wide extended, and his Knees bent, so that his Heels touch his Buttocks, causing the Legs to be held in this Posture by two Servants, and the *Scrotum* to be raised up by another: Then the Operator taking an Instrument made on purpose for that end, shaped like a Lancet, narrow, sharp Pointed, and about four or five Inches long, he thrusts it directly into the Bladder, beginning the Punction on the Buttock's Suture, in the same place where the Incision is usually made in *Lithotomy*; and he will discover what is in the Bladder,

der, by what issues out of the sides of the Instrument; before he withdraws which, he must gently thrust the straight Probe along the side of it into the Bladder. This Probe must be guided with the left Hand, and the Instrument drawn out with the Right, with which the Operator next takes a Silver Pipe of four Inches long, with two Rings at its Head, through which run the Ribban, of an Ell and half long. The hind end of the Probe is then pass'd into the fore end of the Pipe, which serves to conduct it into the Bladder; for if the Instrument which made the Puncture shoud be drawn out before the introduction of the Probe, the Chirurgion would run a risque of wholly losing his way when he endeavours to thrust in the Pipe, wherefore the Probe is absolutely necessary by way of Precaution. After the Urine is all voided by the Pipe, we stop the exterior Aperture of that Instrument with a small Linen Tent, and leave it in the Wound. The Ribban run through the two Rings of the Pipe serves to fasten it to a Girdle, to prevent its slipping out of the Wound. Whenever the Patient would Urine, the Tent must be taken out, and the Bladder thus emptied as often as filled.

Of three Accidents which I have pointed out as those which require this Operation of Punction, there is but one only which we can hope to cure, which is the Inflammation of the Neck of the Bladder, and the *Prostata*; for the Operation being made, endeavours are us'd to cure the Inflammation, by Blood-lettings, Fomentations, Liniments, and other anodyne Applications: When 'tis moderated, and the swelling aswag'd, or come to suppuration, as it sometimes does, the Tent must be taken out, bind up the Wound tight, and in this case we shall find the Urine returning to its ordinary Course, issue out at the Yard. But when the Callosities in the urinary Passage, or a sinking occasion'd by Age, have oblig'd the performance of this Punction, the Patient must resolve to wear this Pipe the rest of his Life. In this case, instead of a Linen Tent, a Silver Screw-Stopple must be used, which will shut it so close that the Urine will never drain out, and the Patient is left in

Condition to follow his Affairs, with this Inconvenience only, that he cannot make Water without unstopping his Pipe, as I have seen several who wore them until their Death.

This Operation though it consists in no more than a single Punction, yet requires the Chirurgion's Anatomical Knowledge of the disposition of the Places where he makes it, as well in order to guide his Lancet directly into the Bladder, as to know what part it may hurt in its Passage; he ought also to see it perform'd several times before he attempts it himself, for it will affright a Chirurgion not very well vers'd in Anatomy, or which has never seen it done: But those who are Masters of the Practice of it, will find it one of the easiest in Chirurgery.

This is the Method hitherto observed in the Punction of the *Perinaum*; but that which *Frere Jaques* has furnish'd us with in order to extract the Stone out of the Bladder, of which I shall presently give you the History, has given me occasion to think that this Punction might more securely be made at that part of the Bladder where the Incision is usually made for the Stone, that is in the Body it self of that Organ near its Neck; so that the Lancet need not be plung'd into the *Urethra*, and forc'd to pass through the Neck of the Bladder, except in case of an Inflammation in which 'tis so tumefied that nothing can come out, and one is in danger to cut the Neck with the Instrument to make a Passage; which may redouble the Accidents, and frustrate the Patient of the expected Fruit of Operation: But if we thrust in this Instrument about a Finger's breadth from the *Perinaum*, and pierce the body of the Bladder near its Neck, I believe the Operation would be more secure and less Painful, since not piercing the *Urethra*, we should not hurt the Neck of the Bladder, and the Inflammation being diminish'd or abated, the Urine would return to its natural Channel at our taking out the Pipe and closing the Wound, which is to be dress'd according to the manner, and will as easily heal as others; for we know at this time of day that Wounds in the Bladder are not Mortal, as was formerly believ'd, provided withal that they are not of a too wide

wide Extent, and that 'tis possible for some neighbouring Vessel to stick to them, and this Operation ought to be call'd *Cystuomia*, from its effectual opening of the urinary Purse.

When the Finger or Probe has convinc'd us that there is a Stone in the Bladder, we are necessitated to proceed to Operation: 'Tis then the Chirurgion's part to discourse the Patient like a Man of Honour, if he desires to distinguish himself from those Mountebanks and Vagabonds, whose Ignorance and Poverty put them upon a thousand base Practices, and the boasting a thousand Impositions; his Prognostick must be founded on the Hopes and Fears suggested by the true State of his Patient's Case, carefully avoiding the promising more than he is able to perform, as some do who practise the Operation of which we are treating.

To discharge the part of an exact and methodical Practitioner in the Performance of this Operation. The Chirurgion ought more especially to have his Eye on three things, and determine what ought to be done, *before, during, and after the Operation.*

The particulars necessary before the Operation are reduc'd to five Circumstances; the first the choice of the Time, the second the Preparation of the Patient by some general Remedies, the third is to resolve whether 'tis to be perform'd by the lesser or greater *Apparatus*, the fourth to prepare the respective *Apparatus*, and the fifth to place the Patient in a proper Posture.

In order to the performance of all Operations, there are two establish'd Times, the one of Necessity, which will not admit of being deferred; and the other of Choice, which allows the fixing on that which is most proper. The Ancients gave the preference to the second with regard to *Lithotomy*, and have order'd us not to perform it unless in the Spring and Autumn: But 'tis a mistake to believe that it ought never to be done but in these two Seasons, for provided that the excessive hot and the too rigid cold Seasons are avoided, I am of Opinion that this Operation may be perform'd in the remaining Seasons of the Year: 'Tis cruelty to see the Patients suffer what is in our Power to relieve speedily. I saw Monsieur

De Corneille, Gentleman in Ordinary to the King, die whilst waiting for the Spring, when he might have been cur'd if he had been cut when necessity requir'd it. 'Tis with this Operation, as with regard to Mineral Waters, which have hitherto been thought unfit to be taken at any other time than in Spring and Autumn, and believ'd to be Mortal at any other Season: But several illustrious Persons have remov'd this Prejudice, by recovering by their means their Health at all times of the Year, and the most celebrated Physicians, Monsieur *Fagon*, amongst others, prescribe them to their Patients almost as frequently in Winter as Summer, as in the more moderate Seasons.

The Preparation of the Patient before the Operation, is a necessary Precaution. He must be bled once or twice pursuant to his Strength, he must take several Clysters, and purge twice if replete with Humours, and as often as Physicians shall judge proper; for to them belongs the Prescription of general Remedies, they frequently assisting the Chirurgions with Advice and Presence in these Operations: The success of which several times depends on a due Preparation of the Patient. Nor must the Chirurgion perform this Operation on the day of, or the day after Purgation, for fear lest part of the Physick issuing out during the Section, very much interrupt it.

Before *John de Romanis*, a Physician of *Cremona*, who was the first inventor of the Extraction of the Stone by the *Apparatus*, and who practis'd it at *Rome* in the Year 1532, this Operation was perform'd by the *Lesser Apparatus*; but at present both ways being practis'd, the Chirurgion must determine his Choice before he goes about it, and resolve which of them he intends to make use of, in order to make the necessary Preparations for either of them.

The *Lesser Apparatus* requires no more than two Instruments, which are an Incision on the Stone, and a Crochet to draw out the exotick Body when discover'd; but the other Method requiring many more, is therefore call'd the *Greater Apparatus*.

They are both spread and shewn on the Table at the head of this Demonstration, whither you ought to guide your Eyes:

That the Chirurgeon may the more commodiously perform the Operation, he ought to have a Purse or Pocket fasten'd before him, in which he should put all his Instruments except the Incision-knife, which he must cause a Servant to hold and give him when Time and Place serve. Two Advantages result from the use of this Pocket, one of which is, that it conceals from the Patient's Eyes the number of Instruments which naturally terrifies him; and the other, that the Operator finds them under his Hand whenever he wants them, without being oblig'd to ask for them.

The *Lithotomist* having then tied an Apron about him, over that fastens his Purse, and having drawn on his Arms two wide Linnen-Sleeves, next thinks of placing his Patient. In the Hospitals there is a Chair provided expressly for that purpose, but in private Houses we make use of a high Table, that the Chirurgeon not being oblig'd to stoop, may carry on his Work more at his Ease. The Patient is plac'd on the edge of the Table, after providing it with a Matrafs, under which a Chair is turn'd wrong end upwards, in order to form an inclining plain, on which the Patient must be lain backwards: Next with two Scarves or Sashes, each of five or six Ells long, and two or three Finger's breadth broad, he is bound in such manner as to enable him from interrupting the Operation by any Motion, he not being then able to stir. Two Servants take the Sashes, which folding in two, they place the middle behind the Patient's Neck, and then descending and rolling them in cross Squares around each Arm, the Thighs being fix'd against the Belly, and the Heels against the Buttocks, the Arm, Thigh and Leg of each Side are so bound together, that the Chirurgeon is absolute Master of the Patient. He must have five Servants, two who on the right and left are to hold the Patient's Legs and Thighs, and draw them as wide as possible; whilst the third mounting on the Table behind the Patient, presses with his two Hands on his Shoulders; the fourth is posted on his right Hand, in order to raise up the Purse of the Testicles with one Hand, and hold them with the other whilst the Incision is made,

the Probe being engaged in the *Urethra* as far as the Belly; and the sixth is to present the Incision-knife to the Operator, receive it from him when the Wound is made, and afterwards furnish him with what he wants. On the Table must be plac'd a Bason or Pot full of warm Water to wash the Instruments, which become too bloody during the Operation, and care must be taken to set a Plate with Oil of Olives, to oil the Probes before using them, or the Operator's Fingers before introducing them into the *Anus*. Thus you see what is to be observed before the Operation.

All things thus in readines, the Operator must go to work as fast as he can, because I suppose him resolved on the manner of Operation, since 'tis impossible to extract the Stone out of the Bladder by either the lesser or larger Apparatus as I have hinted. I shall now demonstrate both these Methods that you may judge which is the best; for I am not willing to take any notice of the Method practis'd by some *Jews* and *Arabians*, of extracting the Stone without Incision, by the force of Inflation, because I believe it impossible, if the Stone be allow'd to exceed only the bigness of a small Olive.

The small or lesser Apparatus deriv'd its Name from the very few Instruments which suffice to its Practice; namely, only an Incision-knife and Crotchet: But after the Chirurgeon has once try'd the great Appatus, he will never cut any besides Children by the lesser. In this Performance there is no need of so many Servants, no more than two requir'd, one to hold the Child, and the other to raise up the Yard and the *Scrotum*. The first ought to be a strong Man, who being seated in a sufficiently high Chair, places a Pillow under him, and hangs before him a Cloth down to the Ground, lest his Legs should be blooded: Thus posted and provided, he takes the Child on his Knees, and having run his Hands under its Knees, he lays hold of his two Arms, which he extends in such manner as to render the posture of the Child very commodious for Section. The second Servant raises the Purse of the Testicles with his two Hands; then the Operator having oil'd the fore and middle Fingers of his left Hand,

Hand, introduces them gently into, and thrusts them far into the *Anus*; the Palm of that Hand being turn'd upwards, he then feels in the Bladder, and with his two Fingers brings it towards the Neck of that Organ, and pushing it as far outwards as he is able, causes it to produce an apparent Tumour, on which with the Incision-knife, he makes his Incision proportionable to the size of the Stone. He ought not to be apprehensive of resting the edge of his Knife against the Stone for fear of blunting it, but on the contrary, he must cut whatever he meets of the Tumour clear to the Stone, without sparing even the Neck of the Bladder, that no small Fibres may remain to detain the Body. The Incision made, the Operator returns the Incision-knife to the Attendant, and with the same Hand takes the Crotchet, which he slides behind the Stone, in order to push it out, in which he is aided by his two Fingers in the Fundament. The Stone then being taken out without breaking, the *Lithotomist* must examine whether any more are yet left behind, that he may draw them out the same way, or with the Stone-Forceps, if not otherwise to be done.

This Operation, though easie to be perform'd, is not approv'd by all *Lithotomists*. They find it frequently attended with Circumstances which render it very dolorous: For instance, if the Stone be gravelly, rough or uneven, and has several acute Angles, the pushing it forwards to draw it towards the *Perinaum*, puts the Patient to horrible Pains, from its Points or Inequalities, pricking the Bladder, which is a very sensible Organ. They add, that being rough, the Incision of its Body is not to be perform'd without Difficulty, which confounds the Operator, and takes up a very long time to perform it as exactly as is requisite, to make way for the Stone to come out easily. These are the Inconveniences which make several Operators prefer the Grand Apparatus to the Lesser.

The second way of cutting is then call'd the Grand or greater Apparatus, from the great Instruments requisite to put it in Execution; 'tis that which is most frequently practis'd, and which to this present time has been concluded the best. The Patient

being plac'd as already mention'd, and held fast by the Scarves and diversly posted, the Operator takes a Probe excavated like a Gutter on the back of its Curvature, and with regard to its dimensions proportion'd to the Subject; and after having dip'd it in Oil, he introduces it into the Yard, and thrusts it into the Bladder. With the end of this Instrument he searches for the Stone before Incision, in order to be again assur'd that there is really one; for 'tis not impossible that he may have been deceiv'd in his first Probing, wherefore if he does not find it in this second, he ought not to proceed any farther: But on the feeling that exoticick Body at the end of his Probe, he causes it to be held by a Servant, who thrusts its Head downwards, that the curve part of this Instrument, which is first introduced, shoving outwards the interior Extremity of the *Urethra*, may the better discover to the Operator the proper place for Section. The same Servant with the other Hand holds up the *Scrotum*, and the Chirurgion with the Thumb and fore Finger of the left Hand, extending the Skin of the *Perinaum*, takes in his right Hand the Incision-knife, ready mounted, which is presented to him by one of his Assistants on the right Hand, who ought to remember to give it to him by the Handle, and not by the Point, as he did to whom Monsieur *Marcchal* gave it to hold him when he cut the Duke of *Grammont*, and who tending him the Knife with the Point towards him, wounded his Hand, which had like to have interrupted the Operation. The Operator next, with all the Assurance of which he is capable, makes the Incision in the Suture of the *Perinaum*, which proceeds from the middle of the *Scrotum* to the *Anus*, he opens the *Teguments* and the *Urethra*, advancing his Instrument to the Groove of the Probe, which serves him as a Guide or Stay to prevent his cutting more than he intends. The length of this Incision must be from two to four Finger's breadth, pursuant to the size of the Stone. There are some *Lithotomists* who themselves hold the Probe in their left hand whilst they make the Incision with their Right; but this depends on the Habit which they have contracted, or the Matters who instructed them. The Incision is no

sooner made, than the Incision-knife is immediately return'd to the same Servant who gave it.

The Lithotomists formerly made use of Guides, shap'd like small Swords, of which the first had a Bill which continu'd thro' almost its whole length, and which easily slid along the Groove of the Probe into the Bladder; and the second, had a Groove at its end, which serv'd to conduct it over the first into the same Organ, and betwixt these two Guides was introduc'd the Forceps; but almost all Operators have substituted in their place a Gorgeret, which they have found much more convenient. The Lithotomist searches for it in his Purse or Pouch with his right Hand, and with the Left he takes the head of the Probe from the Assistant, to whom he had intrusted it; then placing the Bill which is at the end of the Gorgeret into the Groove of the Probe, he by that means guides it into the Bladder, facilitating the entrance of this Engine by separating the head of the Probe from the Belly, with his left Hand, which makes way for the Probe and Gorgeret to enter together into the Bladder.

Some having made an Incision of a moderate length, and withdrawn the Probe, make use of the Dilator, to enlarge the Wound; pretending that a Wound widen'd by the Dilator heals sooner than a very long Incision; because that according to them the Fibres of the Neck of the Bladder are not cut, but only separated by the Dilator: But yet this Practice is not universally approv'd; some prefer a larger Incision before the use of the Dilator; believing that it may occasion a Fluxion about the Bladder, and produce several dolorous Accidents; and really during the space of time which the Operator takes up to make the two Extensions, one in breadth, and the other in length with this Instrument, the Patient is always heard to redouble his Groans and Cries; which prove the excessive Pains which he then endures, wherefore we advise the least use of it possible. The Probe being withdrawn with the left Hand, the Operator takes the Gorgeret in that Hand, and with the Right takes the Forceps out of his Pouch. He generally makes use of the first one, which he introduces,

shut into the Bladder, by means of the excavated Groove along the Gorgeret. Immediately after this Introduction, with his left Hand he withdraws the Gorgeret, which he returns into his Pouch, and with the Forceps, shut, searches for the Stone on all sides of the Bladder; he ought not to open them during the search, because in so doing he might frequently chance to wound the Bladder, or pinch it in re-shutting 'em. When the Stone is felt at the end of the Forceps, the Operator applying both Hands to the Instrument, gently opens it, and endeavours to charge it with the Stone, the size of which he discovers by the distance betwixt the one and the other Ring of that Instrument; and if it seem too large to be drawn out by the Incision already made, he turns the Stone loose into the Bladder, and endeavours to take it up another way; because it frequently happens that a Stone being shap'd like an Egg, that is oblong, is taken first up by its longest part and the second time by its narrowest, when its Extraction is much more easie; whilst on the contrary, should the Lithotomist obstinately persist in drawing out that exotick Body when he has grasp'd it longways, he would put the Patient to the suffering Martyrdom, and that some times in vain. There are tender gravelly Stones which crumble under the Forceps: When this happens the Bits must be taken out as well as the Chirurgion can; there are some Stones so big that 'tis impossible to draw them out, in which case they are left there, rather than kill the Patient in taking them out. If there happen to be two Stones, which we discover by the Knob, at the end of the Curette or Scoop, after the first is drawn out the Forceps is again thrust into the Bladder, and takes it up as it did the former: If there happen to be more, as we sometimes find ten or twelve, the Forceps is to be introduc'd into the Bladder as often as any are left to be taken out. When the Stone is lodg'd on the right or left side of the Bladder, and we cannot come at it with the straight Forceps, the curve ones are to be us'd; with them the Operator may take them up in whatsoever part of the Bladder they are lodg'd. There are stinty Stones, from the Superficies of which fall
off

off some Fragments in taking them up with the Forceps; there are gravelly Stones which crumble under the Forceps, and there are frequently at the bottom of the Bladder a Sand and Gravel, which are necessary to be emptied after the Extraction of the Stone. In these occasions we make use of the Curette or Scoop, with which we empty whatever is at the bottom of the Bladder, the Operation not being perfected so long as any exotick Body remains there. Having well cleansed the Bladder, we take the small Pipe, the end of which dip'd into Oil of Roses, is softly introduced into that Purse, in order to be left there for several Days, according as necessity Requires; 'tis fasten'd to a Girdle by a String, run through the two Rings which are at its Head, that it may not slip out of the Wound.

After having specified what is to be done before, and during the Operation, we are next to finish by describing what is requisite after its Performance. The small Pipe being fixed and secured, which is that which finishes the Operation, we lay on the Wound a Quadrangular and a very thick Bolster, which must be held by a Servant, in order to prevent the Air entering the Bladder, before we dress the Patient. In order to whose Preparation, he must be immediately loosen'd by taking off the two Scarves, when by two Persons he is carried to his Bed, which must be provided with Sheets several times doubled, to prevent the Blood or Urine, which may drain through the first Days, spoiling the Bed. If before the Operation, neither the Band, called a Collar, nor that called a double, hath been applied, it is put on before we dress the Patient; when drawing nearer the *Apparatus*, requisite for dressing the Wound, we take off the Bolster, and lay on the Incision the two Pledgets; and overspread with Astringents, and then the tail'd Plaster, and above that the large Bolster; immediately after which we irrigate with Oil of Roses, which stands ready in the small Plate, the Scrotum, Yard, and whole inferior Venter; we raise up the Purse of the Testicles with a long Bolster, which is called a Truss, and the Belly we cover with what we call a Belly-piece. All these Bolsters

are dip'd in *Oxycratum*, i. e. Vinegar and Water, which is in the Earthen-Plate, and fasten'd by the Bandage; the two Branches of which cross each other on the Wound, and are turned upwards along the Groins, in order to fasten them to the circular Bandage, which surrounds the Body. We bind the two Legs together with a small Band, call'd the Garter, that they may not, by straddling, re-open the Wound, and clap a Pillow under the Knees, in order to keep them a little Elevated; next which we end with giving the Patient some Restorative, or Liquor, which may a little renew his decay'd Strength. I shall not mention the supervening Accidents of this Operation, nor of the Dressing and Methods to be observed, in order to its Cure; to particularize all these Circumstances, would require a whole Volume; I refer you to Monsieur *Tolet's* Book, which has very well handled this Subject.

Monsieur *Thevenin*, a Member of the Company of Chirurgeons at *Paris*, and a Chirurgeon in Ordinary to the King of *France*, informs us, that there are some cases in which we ought not to attempt the Extraction of the Stone out of the Bladder; for Instance, when we believe the Stone too large, or the Patient so old and weak, that he is not able to undergo the Operation, nor to endure the Violence of those Symptoms which will attend an Incision so large as the Bulk of the Stone will require; but if that exotick Body, falling on the Neck of the Bladder, stops that Conduit, and frequently occasions a Suppression of Urine, we are obliged to shove it back with the Probe, in order to make way for the Passage of that Excrement; and it being possible that the frequent thrusting in and drawing out of the Probe, may fret and perhaps Gangreen the urinary Passage, he proposes the following Operation: The Patient must be placed in the same Posture as in the great *Apparatus*, then the Chirurgeon must introduce into the Bladder an excavated curve Probe, and on the crooked part of the Instrument make the same sort of Incision, as though he design'd the Extraction of the Stone, with this difference only, that the Wound must be much leis: Immedi-

ately afterwards he introduces a *Stiletto* into the Bladder, sliding it along the Gutter of the Probe; this *Stiletto* serves to convey thither a Silver Pipe, about four Fingers breadth long; by passing it through the Cavity of this Tube, the *Stiletto* is next withdrawn, and we fasten the Pipe to a Girdle by a Ribbon run through the two Rings at its Head. This Tube is left to continue always in the Incision, and it hinders the Stone presenting it self to the Neck of the Bladder; and, floating on one side and on the other, gives the Patient an easier Life, and frees him in some Measure, from Pain, till he has recovered sufficient Strength to undergo the Cutting; but sometimes this Pipe so little incommodes him, that he chuses rather to bear it than expose himself to the Operation, of which he may dye. This small Pipe must be made to screw at the Top, in order to retain and void the Urine at Pleasure. This Pipe may also serve to make Injections into the Bladder in several Indisp. sitions to which the Organ is liable.

This is the way of performing the Operation which Monsieur *Thevenin* teaches us; according to which Method, the Patient must necessarily void his Urine through the small Pipe, that filling the Neck of the Bladder; for which Reason I should advise the Introduction of a Pipe of the same shape with that which I use in the Punction of the *Perineum*, I would say, into the Body of the Bladder at its Neck: There is no ill Consequence to be fear'd from piercing it in this place, and the Patient would enjoy both the Advantages which he would find by Mr. *Thevenin's* Method, which are to void his Urine whenever he pleases, and to hinder the Stone either falling into, or pressing on the Neck of the Bladder. But another Advantage resulting from the Method which I propose, is, that the Neck of the Bladder being free, and the Stone sustained by the end of the Pipe, which ought to enter the Cavity of that Organ above a Finger's breadth, the Urine will issue out by the *Urethra*, its ordinary Passage; so that the Patient will be subject to no other Inconveniency, than the sole one of being obliged to keep in this Pipe, without being

forced to open it whenever he would discharge the Bladder of its Load of Urine, instead of unstopping it as many times as it serves for an urinary Passage.

The third way of extracting the Stone, is called the *High Apparatus*, from its drawing out the Stone at the upper part of the Bladder; which Method is at present grown out of use. *Nicholas Franco*, a Chirurgion of *Lanzane*, was the first that ever practised it; which he did on a Child, whose Stone was so large, that he could not extract it by the *Grand Apparatus*. He informs us, that in order to perform this Operation, we must cause a Servant to introduce two Fingers into the *Anus* of the Patient, with which, instead of pushing the Stone to the Neck of the Bladder, as in the lesser *Apparatus*; he must on the contrary thrust it towards the *Fund*, or bottom of that Organ, then make an Incision at the bottom of the *Hypogastrium*, directly above the *Os Pubis*, and a little on one side the *Linea Alba*: The Muscles being cut, we open the Bladder at its Fund, which is naturally turn'd upwards; then with a Crotchet, we drive the Stone as in the lesser Operation. Though *Franco* tells us that this Operation succeeded under his Hands, he yet dissuades us from the Practice of it, without giving us any reason for his so doing; we are assured Mr. *Bonnet* performed this Operation on Mr. *Relu*: For my part I don't think it so hazardous as it may be imagined; but believe it on the contrary less dangerous than the lesser and greater *Apparatus*, and that the rather because there is no duplicature of the *Peritoneum*, but the Bladder is so placed that it may be opened without touching that Membrane, or opening the Cavity of the *lower Venter*.

In order to the successful performance of this we must introduce into the Bladder an excavated Probe; whose exterior aperture must be large enough to admit the entrance of a Syringe with which the Bladder is to be fill'd with Water, as warm as that of the Urine. We then make a Ligature about the Yard, that in Syringing the Water do not run out of the Bladder, along the side of the Probe; and when by the quantity of the Injection, we conclude that the Bladder

must

must be full, we draw out the Probe, and pull the Ligature of the Yard a little tighter, in order to press the *Urethra* sufficiently, to hinder the escaping of the Water out of that Passage: The Patient being seated on a Chair almost on his Buttocks, we make an Incision lengthways with a Pen-knife, betwixt the two Heads of the strait, and the two Pyramidal Muscles; after which resting a Finger, on the Fund of the Bladder we feel the Fluctuation of the Water, with which 'tis Tumefied, when with a large armed Lancet we must make a puncture in that place of the Organ. We may easily discover when the Aperture is made in the Bladder, by the Water, which will run out immediately; after which, with a *Crotchet*, we may draw out the Stone, or else thrust a long and narrow pair of *Forceps* into the Aperture through which the Water flows out, and having found the Stone in the Bladder, it will be easie to charge them with it, and draw it out at the Orifice. The Wound heals without Pain, by reason that keeping the Patient in an almost erect Posture in his Bed, the Urine which continually inclines to the Bladder, cannot reach the Wound and hinder its Closure, as in the two other ways of Operation; but besides, always turns into its ordinary Passage in order to run off. If the Incision made on the Belly should seem too large, and it be thought impossible to re-unite it with ease we may make use of a Stitch, and lay on the Wound a Pledget cover'd with *Arcens's Balsam*, then a Plaster, over that the Bolster and Roller, or circular Bandage made of a Napkin, in order to end with a Scapulary Bandage, which will secure the whole *Apparatus*.

All Stones have their beginning in the Kidney, and grow bigger in the Bladder; but don't all stay there, several of them following the Stream of the Urine, run out of that Organ with it, where they are yet but small: But when a Stone has acquired an indifferent Bulk, and makes its way into the *Urethra*, it frequently stops there, and either by reason of its bigness or inequalities occasions such great Pain, that the Patient is forced to have recourse to a Surgeon, who without any delay, is to endeavour to force it out, and that the rather, because it stopping the Passage, he cannot em-

pty his Bladder, which if not speedily remedied wou'd prove of fatal Consequence.

'Tis very easie to discover the place where the Stone is stop'd, the Patient himself shews it; and though we touch it never so little, we feel a hardness caused by that exotick Body. The Surgeon ought first to endeavour with his Fingers to make it slide along the *Urethra*, in which he is assisted by the Urine, which pushes forward in order to drive it out. But when he cannot procure its proceeding forwards without violent Pains, with a small Band he must bind the Yard, beyond the Stone, towards the *Pubes*, and inject into the remaining part of the Passage of the Yard, Oil of *Olive*s with a small Syringe. The Ligature prevents the Injection driving back the Stone, and it's returning back the same way. This done, the Surgeon attempts to advance the Stone forwards, which is perform'd with much less Pain after the oiling of the Passage: But if he finds it impracticable to get it out, without more forcible means, he takes a small *Scoop* about 4 or 5 Inches long, which he dips in Oil, in order to thrust it up the Yard, and slide its end on one side, of and beyond the Stone, and by that means draw it out. This expedient frequently succeeds; but if it fails the Surgeon must proceed to Operation, without a Moment's Delay.

He must then take off his first Ligature, in order to draw the Skin which covers the Yard, as much as possible towards the Root of that part; and then apply the same Ligature above or beyond the Stone, when with the Left-hand turning the Yard, that the *Urethra* may be raised upwards, and holding the Stone fast betwixt two Fingers, with a small Penknife he makes an Incision on the Body of the said Stone, cutting the *Teguments* and the *Urethra*, not a cross, but lengthways; which done, he takes a small *Scoop* provided with a Handle, and shap'd like an Ear-picker, which he slips under the Stone, and by these means forces it out: That done he takes off the Ligature, and the Skin returning to its ordinary place, stops the Wound made in the *Urethra*. These Wounds are dress'd like the more simple ones, with a Plaster of *Ceruse*, a Bolster, and a Band, roll'd about the Yard in:

a circular Manner: The Urine passing thro' the *Urethra* cleanses and cures it, with the assistance of Surgery.

I have frequently found that the Stone, after having made all its way, in order to pass through the *Urethra*, has stop'd at its Extremity; which happens to those, the aperture of whose *Glands* is smaller than it ought to be, which are very often seen towards the insertion of the *Urethra* into the Root of the *Glans*. A Child was once brought to me which had a Stone stop'd at the end of the *Urethra*, and finding one end of it to be coming out, I made use of the point of a Lancet to distinguish this part of the urinary Passage above and below, and with a small *Forceps* drew it out.

Though the *Urethra* in Women is shorter and larger than that of Men, and by reason of this favourable natural Disposition, small Stones, Sand and Gravel may more easily pass with the Urine; that Sex is not yet exempted from being afflicted with Stones in the Bladder, which fatigue them as much as those in Men, and as necessarily must be removed by Operation. Women are generally cut two Ways, either by the Lesser or Grand *Apparatus*.

That of the Lesser *Apparatus*, not only requires few Instruments, but is executed without making any Incision, in the following manner, *viz.* The Woman being seated in a high Chair, leaning backwards, her Thighs extended wide, and raised, the Surgeon takes a Probe, dips it in Oil, and through the *Urethra* conveys it into the Bladder, in order to search for the Stone: The excavated part of the Probe serves to guide a *Dilator* into the Bladder, which is no sooner entred than the Probe is drawn out, and the Operator extends the *Urethra*, with the *Dilator*, to the performance of which no great efforts are requir'd, that Passage being Dilatable beyond the bounds of Credibility. This done the Surgeon withdraws his Instrument, and having oil'd two Fingers of his Left-hand, introduces them as is before hinted, into the *Vagina*, if the Patient is a married Woman, and into the *Anus* if a Virgin; and with his Right-hand pressing the Belly, he gently moves the Stone to the Neck of the Bladder, from which it easily enters the Mouth of the *Urethra* already Dilated. When he dis-

covers the Stone, removing his Right-hand from the Patient's Belly, he substitutes that of a Servant in its place, and retaining the Fingers of the other Hand still in the *Vagina* or *Anus*, he with them pushes the Stone into the *Urethra*, then slides behind it the *Crotchet* in order to draw it out, as is done in Children cut by the lesser *Apparatus*.

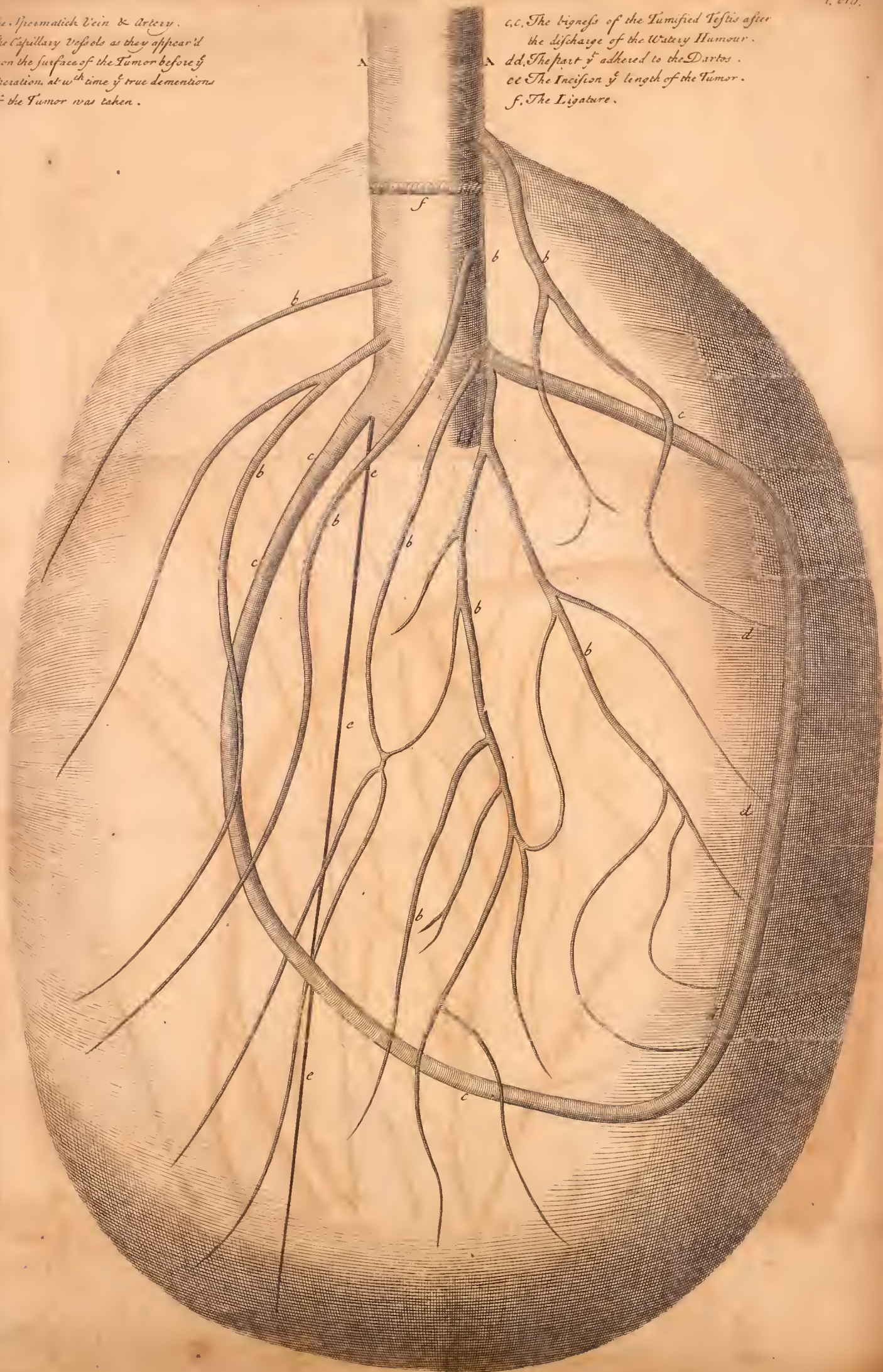
Some Operators affirm the great *Apparatus* to be less painful than the Lesser, and prefer it for that Reason; but after explaining what farther remains, I shall leave it to your Decision. The Patient must be seated in a Chair bound with Scarves, and held by Servants, and into her *Urethra* must be thrust a Probe or Conductor which may serve to guide a simple *Dilator* made purposely for Women, of which there are three Sorts; the choice of either of them is left to our Liberty; but that with the Spring is most used, having gently widen'd the *Urethra*, and the *Dilator* being open'd with a strait Incision-knife, the extrem Orifice of the urinary Passage must be cut a little to the Right and Left. This Incision must be larger or smaller in Proportion, according as we conclude, the Stone to be great or little: The *Dilator* is then drawn out, and on the Probe or Conductor which must be first thrust into the *Urethra*, we guide the *Forceps* into the Bladder, and then withdraw the Conductor with the *Forceps* we search for, and seize the Stone, which we must draw out by gentle Motions alternately on the one side and the other, without any great Force. We may make use of a small *Gorgeret* somewhat narrower than that used in the Section of Men: And some content themselves with an excavated Probe: The fewer Instruments we use the better.

In above three fourths of the whole number of Women which are cut, there remains an involuntary Evacuation of Urine, especially in those from whom a large Stone has been taken. This accident never fails to attend them by reason that the too great Dilatation forces and breaks the Fibres of the *Urethra* and *Sphincter*. If we could extract the Stone by the high *Apparatus*, this inconvenience would be avoided; but I dare not advise it before having seen it several times practis'd, yet since that way has been found to succeed with Men, I don't doubt but it may be proper for Women. Seve-



*A. The Spermatick Vein & Artery.
b, b. The Capillary Vessels as they appear'd
upon the surface of the Tumor before &
Operation, at wth time & true dimensions
of the Tumor was taken.*

*c, c. The bigness of the Tumified Testis after
the discharge of the Watery Humour.
d, d. The part & adhered to the Dartos.
e, e. The Incision & length of the Tumor.
f. The Ligature.*



Several Remarkable Cases which have been communicated to us by Physicians, Surgeons, &c.

SIR,

Here send you the exact Figure of a tumefied *Testis*, which wants a Name, for it was not, *Hernia Aquosa*, nor *Hernia Carnosa*, nor *Hernia Seminalis*, but a complication of them all three; as you'll find if you'll please to give your self the trouble of reading the following History of the Operation.

The Patient's Name is *John Roberts*, lives at *Foulden* in *Norfolk*, his chief Business is Hempdressing, he is not sensible of the least Hurt, or previous Distemper, that should occasion this prodigious Tumour, unless standing in the Water above the Middle, by the whole day together, and that for a Fortnight successively, (as those People are obliged to do, when they Water-yet their Hemp) should be the occasion on't.

The Tumour increased to the Bulk you see expressed in the Figure, in Nine Months Time, and what with the Pain, and Weight of it, he was reduced to a Skeleton; when he first offer'd himself to me as a Patient, declin'd it, thinking it impossible, he should survive the Operation. He return'd home dissatisfied, and in less than a Month after, (his Pain increasing) he return'd to me again, with so much Resolution to have it perform'd, that I could not deny him; so in the 8th of *September*, I call'd my very good Friend *Dr. Barker of Linn* to my Assistance, and having also, (by chance) the Assistance of my Friend *Mr. William Ellis*, of *Boston* in *Suff.* who was formerly my Sergeant: We perform'd the Operation, an exact account of which follows.

After having fixed him on his Back, upon a Table; and a strong help about him to hold him fast, I cautiously divided the *Scrotum*, by a small Incision, no larger than just to receive the end of my Thumb, fearing that the weight of the Tumour might have so relax'd, and distended the *Peritonæum*, that (with the struggling of the Patient) the Intestines might prove troublesome, which the Aspect of the part gave us no small reason to suspect; but I was soon undeceived, for, perforating the *Dartos*, I was saluted on the Face, with two or three Spoonfuls of urinous Matter, of a yellowish Colour, altogether inodorous, I immediately stop'd the Orifice, and call'd for a Bason, in which I saved a Quart of the same Humour. I then with a pair of large Probe-Scissors, divided both the *Scrotum* and *Dartos*, the whole length of the Tumour, and turn'd out the tumefied *Testis*. The spermatick Vein and Artery, I found as big, as represented in the Figure, which I secur'd by a strong Ligature, and then divided them, but instead of the *Testis* falling a way as I expected, I found it adhered to the *Dartos*, next the suture only, which I separated, and presently fill'd the Wound with Pledgits of fine Flax, dip'd in *Colebatche's* Solution, then made my Bandage, and left him as easie as possible; about an hour or two after the Operation we were alarm'd with a Flux of Blood, from one of those large Capillaries, represented in the Figure, (which I suppose happen'd not to be so well covered with the Stiptick as it ought) which Flux, though not great, gave

us fresh Trouble, and obliged us to remove all the Dressings, and apply a fresh Stiptick, after which it bled no more. I removed the dressings the second Day, and on that part of the *Scrotum* that had suffer'd such a vast Extention (and by the Excision of the Tumour being deprived of its Nourishment) I found a slight Mortification (which indeed was nothing but what I expected) I then proceeded with Fomentations, and warm Digestives. The Patient in the mean time observing the Rules of Diet, with a great deal of Regularity, and for the support of his Spirits drinking plentifully of the *Decoctum Album*, made him a little Cordial with strong Cinamon-water, and taking every Night a gentle Paregorick Draught, in short time the *Eschars* separated. The Wound incarn'd so fast as is hardly credible. The remaining *Scrotum* contracted to very near its natural Bigness, and three Weeks after the Operation he return'd home in perfect Health.

N. B. Upon Dissecting the *Testis* we found nothing in't, but a vast quantity of extravasated Semen, from whence we may call it *Hernia Seminalis*; from its fleshy Adhesion to the *Dartos*, we may call it *Hernia Carnosa*: And from the vast quantity of watery Humour contain'd in the *Scrotum*, *Hernia Aquosa*; these three put together will make a rare rumbling Name, which if you'll please to help me out with, you'll very much oblige,

Your humble Servant,

H. Cozens.

Mrs. Jessop's Case of East Bradenham.

ON the Eleventh of November 1701, Mrs. Jessop was taken with a total Suppression of Urine, she had all the Remedies that could be thought of by Dr. Howman, Dr. Ellis, and my self put in Practice, but fruitless, and amongst the rest she took two Bottles of the famous *Tipping's* Liquor, but to no more purpose than the

rest, but at last: after a ten Days Suppression she was relieved by the use of a Bath, and made Urine again very freely for two Days, and Nights, then stop'd again five Days, but upon using the Bath, was relieved again, and made Urine plentifully three Days, then it stop'd again, three Days after which she had a dreadful Convulsion, 48 Hours after another, 24 Hours after that a third, and 30 Hours after, the fourth Fit put a period to her Life.

During all this Sickness (nor before that I can hear of) she made no complaints of the left Kidney, neither was the pain on the Right, very burdensome, unless it were the first 24 Hours, and again upon the second Suppression of Urine, at both which times it was very Sharp.

Before she had been ill ten Days she was sensible it would be her Death, and made me promise to open her, and directed me to the place where I should find the Stone, which was near the right Huckle Bone, within three Inches of the Bladder; I accordingly Dissected her the Morning after she died, and in the left Kidney I found a Stone, that weigh'd one Dram two Scruples, of a chalky Substance: It was fast fix'd in the Mouth of the Ureter, and the Kidney wast'd away, and shrivel'd up like an empty Purse, and doubtless had been useless many Years. The right Kidney I found four times as big as it ought to be, full of a Mucilaginous Matter, and the fleshy part perfectly Rotten, and (as I said before) within three Inches of the Bladder I found the Stone she complain'd of; exactly of the Colour and Shape of a Datestone that weigh'd ten Grains.

In the Gall-Bladder I found one and twenty Stones, three of which were as big as small Nutmegs, and each weigh'd half a Dram, the other eighteen being smaller, were weigh'd together, and they weigh'd one Dram one Scruple; these Stones of different Sizes and strange odd Shapes, but so exactly polished, that Art can't exceed it. There was nothing of choler in the Gall, but about half a Pint of a Whey-colour'd thin Mucilaginous Liquor; the Liver was extremely swell'd, but not much discolour'd; the Spleen was also swell'd, but not

not Scirrhus, and the Mesentary without any manner of Fault.

The Case of a Young Maid of Eighteen Years of Age, who had a Suppression of Urine.

JUNE the 28th, 1705, I was sent for to *Elmham* in *Norfolk*, to a young Maid of 18 Years of Age, that had not made a Spoonful of Urine in 48 Hours, and was in as much Torture as a Woman in Travel.

Going to put up a Catheter, I found the *Hymen* impervious, and driven out beyond the *Labia Pudendi*, as big as a large Goose's Egg, and the pressure so great: That the *Meatus Urinarius* would scarce admit of the Instrument; at last with great difficulty I discharged near five Pints of Urine, which gave her a great deal of Ease: But her Body still remaining as big and as hard as a Woman's half gone with Child, I believed the stoppage of Urine to proceed from no other Cause, but the Extention of the *Vagina*, so I told her Mother and Relations, (who knew nothing of the Swelling till the Day before they sent for me) that unless care was taken of that Swelling, (as they call'd it) she must never expect to make Urine again without the help of an Instrument. The good Woman asked me what sort of Swelling it was; (they having never seen nor heard of any such thing, could not conceive what was the Occasion on't, which fill'd them full of dreadful Apprehensions, about having the Operation perform'd: I explain'd it to them in Terms as suitable to their Capacities, as the Case would bear, and told them that the outward Orifice of the Womb, was perfectly closed from her Birth, so that when she came of Age, that the Womb according to the Custom of Women, discharged it self from the Courses, they fell into the Neck of the Womb, and were there retain'd, so that the Tumour had been gradually increasing er'e since, according to the quantity of her Monthly Evacuations: I then ask'd her how long she had been sensible of this

Swelling, she own'd it had been encreasing near two Years, but being no trouble (till of late) she took no notice on't, hoping in time she should be as other Women. This Relation of the Girl's, caus'd them to give the more Credit, to my Opinion, so they presently agreed to bring her to *Swasham* the next Day, and as I said before, so it proved, for she made not one drop of Urine, from the time I left her, till she came to *Swasham*, so with the Catheter as before, I relieved her of about four Pints, and then prepared for the other Operation. After all things were ready, I placed her in a convenient Posture, and made an Incision from near the *Meatus Urinarius*, to the *Perinaum*, and discharg'd near eight Pounds of extravasated Blood, very Black, but not Fetid; I dress'd her up with proper Pledgets to keep the Lips of the Wound from Closing, and in a Week's time restor'd her to perfect Health, and perfect Woman.

To the Author of the Bibliotheca Anatomica.

S I R,

A Poor Woman of *Marham* in *Norfolk*, about six Months gone with Child, came to me for Advice. Her Case was so very uncommon that perhaps it may be thought worthy of a Place, in the *Bibliotheca Anatomica*, or the *Appendix* to it, if it comes not too late.

She told me, that of her first Child, she had a very difficult Labour, and she fear'd her Midwife had not done her Justice, for now she was in such a Condition, as she believ'd no Woman but her self was ever in; for her Belly with the Child, hung (as she walk'd half way down her Thighs, and when she sat well nigh cover'd them; and that was not all; for at the bottom of her Belly, was a sore place (as she call'd it) that she fear'd her Bowels would fall to the Ground, and beg'd of me to assist her. When I came to inspect the Parts, I found (to my great surprize) a Laceration of the *Peritonaeum*, and also of the Muscles of the *Abdomen*, they opening to the right and left, from the Navel to the *Pubis*, as if the *Linea Alba*, had been divided by Incision,

so that nothing prevented the *Uterus*, with the contain'd *Fetus*, from falling clear out her Body; but the Skin, and *Membrana Carnosa* of the *Abdomen*; and at the lower part of this vastly extended Skin, near the *Pubis*, was the aforelaid sore Place, which was a Mortification, as broad as a Man's Hand, with a thick *Eschar* accompanied with some Pain, and discharge of Fætid sanious Matter, all which was occasion'd from want of natural Heat, which the parts were depriv'd of, by being so preternaturally extended with the constant weight of the *Fetus*, &c.

I placed her in a convenient Posture, in order to reduce the *Uterus* into it's proper place, which I effected with the greatest ease imaginable; but then there was so much Skin to spare, that I knew not what to do with it, from which I no sooner removed my Hand, but upon the least Motion of the Woman, the *Uterus* immediately followed into the Skin as before.

The danger she was in from the Mortification, she had no Notion of; neither was she under any Apprehensions about it, but I found her Design of coming to me, was to engage me in a Promise, to assist her in her Labour, she fearing (and not without a great

deal of Reason) that it would be accompanied with the greatest Difficulties, if not prove Fatal, especially if under no better care than the Midwife she lived near: I promised in case of Necessity, to assist her, and order'd (for the better retaining the *Uterus in situ*) a Bandage broad enough to receive all the extended Parts, and to be supported with stoops over each Shoulder: The Ulcer I caus'd to be dress'd every Day, with a Plaster of *Basilicon*, and without the Application of any other Medicine; (the farther extention of the *Abdomen* being prevented, by the Bandage, and the Parts kept warm) the *Eschar* soon digested, the Ulcer incarn'd, and in a short time cicatrised, and at the end of nine Months, she was (without any manner of Difficulty) deliver'd of a hearty strong Child, wanting no assistance, but what three or four Neighbours afforded; she recover'd much better than of her former Child, and soon after came to give me this account of her Success: She continues very Healthful, only oblig'd to wear a strict Bandage; for upon the least default, she has the same inconvenience from the *Viscera*, as she had when Pregnant, for which there seems to be no Remedy, her Poverty exposing her to all sorts of servile Labour.

*An Account of several Wounds and Diseases, with remarkable Cases and Cures on several Persons.
From G. Bidloo.*

Of the Nerves.

WHAT has hitherto been urged concerning the Animal Spirits, and their Passage through the Nerves, I acknowledge my self not reconciled to; and that after an indefatigable Diligence, and repeated Experiments, I am not so happy as to discover any sure and unquestionable Appearances of the Matter

asserted. But however, as a Satisfaction and Compliance to my Pupils and some worthy Physicians, I enter'd *Anno 1697* upon the following Disquisitions in Presence of a learned and grave Assembly.

I. Upon making repeated Ligatures on the large Femoral Nerves in a living Dog, sometimes near the *Inguina*, and at other Times near the Knees, I observ'd the Intumescence to be always below the Ligatures; but the contrary happen'd upon tying the small

small Arteries that were bestow'd on the Membranes of the Nerves.

II. About an Hour or two after I loosen'd the Ligature, the Nerve, together with its Blood-vessels, recover'd their pristine State.

III. Upon the slitting or cutting a Nerve in two, that *Succus* which is pronounced peculiar to this Organ, was so far spontaneously from flowing out at either Extremity, that it could not be express'd even by Force.

IV. Upon dividing a Nerve, either according to its Length, Breadth, or across, there did not distil from it so much *Succus* as to leave the least Speck upon a Piece of white Paper.

V. A Nerve punctur'd or cauteriz'd, upon Separation of its Eschar has not the least Appearance of a Fluid.

In large Cutaneous Ulcers, and some Sorts of Scabs, there is very often observ'd a *Stillicidium* or Gleet, which indeed is no more than what appears upon the Application of *Cantharides*; and this very probably flows from the Blood-Vessels and Lympheducts, and not from the Nerves and Tendons.

The Substance of the Nerves (says our Author) appears to be nothing more than indefinite tensile Filaments distributed thro' the whole Animal Oeconomy, whose Sides are co-adapted without any Interstices, being sheath'd in proper Membranes, and distinguish'd into several *Fasciculi*. These Filaments upon Maceration, Putrefaction, or the like, lose their Contiguity, and recede one from the other, whence there is an Appearance of some transverse *Fibrille*; but whether these were small Ligaments, which seems most probable, or the torn Membranes of some of the Fascicles, I could not discover. I should have observ'd, that I never found any Lymphaticks within, but always without these Conduits, dispers'd over the *Superficies* of their Coats; nor have I ever seen any Valves in the Fascicles of the Nerves: Wherefore this Argument of theirs is invalid who maintain, That when a Nerve is divid'd, and Mercury effused on the *Superficies* of its *Tubes*, it will not permeate it. Therefore (say they) its evident that the Obstacles are Valves. Now, the *Stamina* of the Nerves

are solid, not tubous Bodies, nor are they separated by Interstices: 'Tis for this Reason that Mercury won't permeate their Superficies, nay, though you were to force it with your Finger. Hence I gather, that its impossible to demonstrate the Animal Spirits, and that their Influx into the Muscles is not materially necessary to voluntary Motion. It's possible for a Muscle to be put in Motion from its own Disposition of Parts, and the Motion and Action of the Blood upon its Nervous and Tendinous Fibres; as I have elsewhere sufficiently prov'd.

Now that thin, and sometimes viscid Gleet, which we see ouze from a wounded Tendon or Nerve, is chiefly to be imputed to the Lymphaticks, and inbiant Mouths of the Arteries, which appear like so many Spots in the Wound.

Of Hydatides.

There are several Kinds of *Hydatides*, but easily distinguish'd: 1. From a Dilatation of the Lymphaticks in the Space between the Valves. This Distention, when the Vessel is obstructed in its upper Part, is produced sooner or later, according to the Force the contain'd Liquor is impell'd with from the Glands: That the Distention happens between the Valves, and not in their Region, appears from the Disposition and Structure of the Vessel it self; for the Sides of the Valves are thus tied in order to prevent their receding one from the other, and give no Opportunity for Distention in this Place. 2. Though the Lympheducts in general may proceed *Ab Angusto in Angustum*; yet in several Places between the Valves with respect to their Latitude they have different Dimensions, and the Valves themselves with regard to Longitude are distant one from the other in a different Dimension, which may be prov'd by an Injection of Mercury, or any other Liquid; nay, if the Mercury, or whatever else injected, break through, either by its Weight or Force of Infusion, the Vessel will never burst in the Region of the Valves. That the Lymphaticks may, and in what Manner, be obstructed, I thus endeavour to prove:

'Tis evident both from living and defunct Animals, that where a Lymphatick is more than ordinary distended, there it is generally obstructed; and upon Pressure of the distended Part you may easily discover *Hydatides* of different Magnitudes, such as are found in the Lips, Eye-Lids, &c. Now, whenever an Obstruction happens just where the Vessel emerges from the Gland, they are not so easily discover'd; for the Vessel being now render'd uselefs, its Sides, for want of its accusom'd Fluid, fall together, so that it has no more the Appearance of a Vessel, that is, in its upper Part, but of a Membrane or Ligament. On the other Hand, if the Obstruction happens in a Part more remote from the Gland, then the Series of *Hydatides* is very demonstrable. The second Kind of *Hydatides* spring from those Glands where the Arteries terminate, and the Veins have their Origine. (*Vid. Disput. Physiolog. Anat. meam Quartam.*)

'Tis to be observ'd, That these and the like *Hydatides* admit of no Cure but a Chirurgical one, viz. by Compression, Ligature, and Extirpation by Knife or Fire: Causticks are not safe. On the contrary, those that may be perceived at the Touch, be they never so big, may without the least Danger be extirpated. *Hydatides* which possess a Glandulous Viscus, such as the Liver, Spleen, &c. are incurable.

The Figure of *Hydatides* every one knows to be generally round or spherical.

There is another Kind of *Hydatides* worth Observation, a Disease very frequent in the Inside of the Lips of Scorbutick Persons. In the Beginning they are livid, indolent, soon flag, and become a whitish Ulcer, which, if not taken Care of, will terminate in a Gangreen of the soft Parts, and a *Caries* of the Bones, and sometimes prove the Death of the Patient.

Their Method of Cure is this: The Part must be scarified 'till a good Quantity of pure Blood follows, and afterwards wash'd with a Solution of *Cypress-Virriol*, which must be repeated twice or thrice a Day: As for Universals, you may use Volatiles. If the Malady increases, an Injection of the Juice of Celandine would be very convenient, and a *Forus* of fragrant Herbs and

Seeds. Avoid the Use of Spirit of Wine, which will make Callous Lips; Myrrh, Aloes, &c. are also to be rejected.

This Kind of Swellings, common to the Lips and Cheeks, is vulgarly, but without Reason, called a *Cancer*; for a *Cancer* is a Disease of the Conglomerate Glands, and not the Lymphaticks.

Of the Phlyctæna.

Phlyctæna are small Elevations between the *Cuticula* and *Cutis*: They arise in several Parts of the Body; and those of the Limbs differ from those of the Eyes. The *Phlyctæna* of the Limbs appear in Form of Pellucid Vesicles, fill'd sometimes with a yellowish, and sometimes whitish Water, breaking out on a sudden in several Places with Itchings; and if not open'd they dry, and have very much the Face of an Eating-Ulcer, or Squamous *Herpes*. The *Phlyctæna* of the Eye is seated either in the *Adnata* or *Cornea*, and does not shew it self in Form of a Vesicle: It contains no Liquor, and differs in these Circumstances from those of the Limbs, in that it always breaks out singly, slowly, and without any *Pruritus* or Itching, and if not cured has the Appearance of a dried and incrusted Ulcer. The *Phlyctæna* of the Limbs, as the Legs, Hands, and Feet, elevate the *Cuticula* in several Vesicular Tubercles, which being cut off, and the Serosity dried up, there are offer'd to View several Asperities and small Eminencies, more or less, according as the Glands or *Papillæ Pyramidales* are more or less affected. This Serosity seldom continues above four or five Days, in which Time the Part either consolidates, or degenerates into a scabby Ulcer, with the Induration, Inflammation, and Excoriation, of the Circumjacent Parts. When these Ulcers grow inveterate, it often happens that a foul Excrecence throws it self out, and the Lips of the Ulcers grow here and there callous. Hence we may see that the *Phlyctæna* of the Limbs affects the cutaneous Glands and *Papillæ Pyramidales*, and that of the Eye the Artery only.

That the Artery in a *Phlyctæna* of the Eye is chiefly affected, I presume may be confirm'd

firm'd by the following Reasons: First, 'tis contrary both to Reason and Experience, that this red Exuberance on the *Cornea* or *Adnata* should rise from the Vein, since that returns the Blood from the Coat; neither is it a part of the Vein, for it has no *Pellicle*: Besides, were it Venous Blood thrown out, it would not be of so florid a Red, as it is all along, but of a dark brown Colour; neither would it encrease momentarily as a *Phlyctena* does: For the Blood has no retrogradation in the Veins. Secondly, That it is not of the Lymphatick kind, is evident from its Matter, Origine, &c. and the Fabrick and Use of the Lymphaticks themselves. Thirdly, That it is owing to an indisposition of the Nerves, no Anatomist can ever imagine. Fourthly, 'tis impossible to prove it to be an affect of the Coats of the Eye, because they suffer only from the *Phlyctena's* pressing upon them; for it's evident they may be separated without lacerating the Coats. Fifthly, Nor can the Glands of the Eye be in fault, since it is seated far enough from them. Sixthly, That the *Ductus Lachrymalis* can't produce this effect needs no proof; for it don't discharge Blood but a Limpid Water: Hence we readily conclude, that the Artery is the efficient Cause of this Distemper in the Eye. This *Phlyctena* can't be suppos'd to be an incipient Inflammation; for since in that, one or more Branches of the Artery are obstructed, but in this they are open'd. Thus much of the difference, rise and progress of this Distemper; we shall now briefly touch upon its Cure. In the Cure of the *Cutaneous Phlyctena*, the Patient must observe a Lenient Diet: The Topicks are to be Anodynes and Desiccatives, such as diluted Wine, Solutions of *Opium*, *Ung. Alb. Camph. Diapomph. Aq. Litharg. Aq. Plantag.* &c. Plaisters and Unguents in general are to be avoided. If it degenerates into an Ulcer, it must be treated as one; in which Case Sulphurs and Mercurials taken, mix'd or single, are very profitable; If it be turn'd into Scabs, it is to be cur'd as one. In the Cure of a *Phlyctena Oculi*, all things that put the Blood in too great a Motion, are to be avoided, as also Oil, Fat, &c. You must not attempt to bring it to suppuration, because the Matter impact in

it never degenerates into Pus; therefore suppurating Cataplasms, Fomentations, &c. are of no use: The Remedies to be applyed in this Case, are to be such (if possible) as dry with little or no Incrustation, as *Gummi Arabicum*, *Gypsum*, *Sarcocolla*, *Cerussa*, &c. but you must take care to reduce them into an impalpable Powder; these in time will gently dry and cicatrize the Ulcer.

*An extraordinary Case of extracting
an extraneous Body out of a Wound.*

I Shall begin with a very remarkable Case of one *John Hendrick* a Dutchman, Aged 35; he was a Marine on board a Convoy-ship call'd the *Utrecht*, commanded by Captain *Dekker*, Anno 1690. On the 10th of July, in an Engagement off Cape *La Hague*, between the French and Confederate Fleets, this Person was wounded by a small Shot, in the upper part of the left Fore-Arm near the Cubit, and at the same time received two large Wounds on his left Breast by the Splinters that flew about. It happen'd that the same piece of Cannon wounded several others, which gave the Surgeons Suspicion, (as they afterwards found) that it was charg'd not only with a single Ball; but a Bag also stuff'd with Small-shot, and bits of old Iron: But however our Patient thus wounded, was, with the rest of the wounded Men, the next Day carry'd to an Hospital in *Port Duyns*; where, in a Month's time his Wounds were heal'd, upon which he came to *London*; however he being from his Infancy us'd to the Sea, and having made several Voyages both to the *East* and *West-Indies*, had no long stay here, but took a Resolution to go in the *Scotts* Service: Upon his return some Years after, he complain'd of a prodigious Pain about his Loins, and upon viewing it, there appear'd a Tumour near the *Ilia*, which was open'd, and discharged a quantity of *Ichore*. The neighbouring Parts were mightily inflamed and indurated, and in short it became Fistulous; the Orifice of the Ulcer was sometimes open, and sometimes clos'd by Proud-flesh, discharging sometimes an Ichorous Gleet, and at other times

nothing at all: Under these calamitous Circumstances, he apply'd himself to several Physicians and Surgeons but all to little or no purpose. By this time his Affliction encreasing, and his Patience worn out, he came to my Collegue D. *Dekkers*, who after examining the Case, sent him to me.

Upon the Patient's telling me this Story, I made a strict examination, and found a fistulous Ulcer, whose Orifice was stop'd by Proud-flesh, its Lips Livid, and the Skin mightily inflamed; It run between the *Spina Illi*, and transverse process of the last *Vertebra* of the Loyns, on the left Side: The conterminous Parts were much indurated; upon passing my Probe I could feel something hard, which I judg'd to be part of a process of one of the *Vertebrae*; wherefore I dilated the Orifice with a Sponge-Tent. About five Days after, the Patient fell ill of a Fever, and what with that, together with the extream Pains of his Wounds, he refus'd to let me dress him any longer; but however, with much a do, I prevail'd upon him to let me take the *Fungus* down; which I did, and having made way for my Forceps, I endeavour'd, with them, to extract that Substance (which appear'd now blackish) I took for a Bone, but this my attempt was fruitless, for it stuck very fast; therefore I dilated with my Probe-scissors about a Thumb's-breadth, and deferred the Extraction of the Body till the next Day, which was about that Day 11 Years since he received the Wound in his Breast; In passing my largest Forceps I laid fast hold on the hard Substance, and drew it forth, which (to the great Astonishment of the by-Standers) appear'd not to be Bone, but a piece of Iron, about 3 Inches long, and one broad, and rough at each end; afterwards I gently pass'd my Finger to feel whether I could find any more extraneous Bodies, but perceiving none, I slightly fill'd the Wound with Pledgets dip'd in *Ol. Hyperic. & Ung. digest.* warm'd, washing the Lips with a Solution of *Vitriol. Cyprin.* and over all apply'd *Emp. Defens. Vigon.* by which means (and the assistance of God) I consolidated the Wound, and made a firm and even Cicatrice.

A Short Account, with an extraordinary Case, of Varices.

IN the Year 1701, at the latter end of April, came to me one *John Roberts* about 41 Years of Age; he was a Man of a spare Habit of Body, supported by Crutches, who through excessive Pain rather crawl'd than walk'd; and every step he took oblig'd him to cry out. When he had untied his Stocking, I saw on the outside of his Knee three large *Varices* of a Livid Complexion, and so distended with Blood, that I thought they would have burst the Skin: I inquired then into their Cause, Rise, Standing, and how they alter'd from time to time; and found by his account that when he was about 8 Years of Age, there was a red Pustle as big as a large Pea, broke out on his Knee, which, tho' it daily encreased, he neglected 'till it came to the bigness of a Pigeon's Egg, and then came to *Utrecht* and shew'd it to a French Surgeon, who after chiding him for his Neglect, undertook the Cure, which was as follows: He pass'd a strong Ligature round the *Base* of the Tumour, and with a large Incision-knife cut it off, but left a fordid Ulcer behind, which another Surgeon after a great deal of Pains and long time slightly Cicatrized. This notwithstanding with two other Tumours of the same kind encreas'd every Day, and the poor Man's Case grew from bad to worse: He suspected the Cause to proceed from carrying heavy Burdens, which he had been us'd to from his Youth; He afterwards liv'd at *Leyden*, and carry'd Milk about the Streets, till at length one of the *Varices* was distended to such a Degree, that it was as big as a Child's Head, and look'd as if it were mortifying; for the *Cutis* appear'd black in several Places, and the *Cuticula* pill'd off it: Whereupon, being often feverish, and thro' loss of strength scarce able to bear Pain any longer, he desired the Assistance of *Christian a Steeneveld* a late famous Surgeon, who in consultation with D. H. *Oosterdyk Schacht*, attempted to cure that which hung down upon the *Tibia* by Incision;

sion; pressing therefore a great quantity of Blood from the *Varix*; he treated the Wound according to Art, and after having deterg'd it, he endeavour'd to cicatrize it, but to no purpose; for the *Varix* was neither suppress'd, nor taken away, but on the contrary protruded a-new, and look'd like a *Sarcom* or *Hypersarcotick* Ulcer.

After he had try'd the palliative means of several Physicians and Surgeons, and found with them, that the *Varices* grew bigger and bigger, and his Pains increas'd, even to the loss of the use of his Knee, he then came and consulted me: Whereupon, together with some Physicians and Surgeons whom he had made Application to, I took care of him, though several of them caution'd by the Opinion of the Ancients, pronounced such *Varices* incurable, and therefore not to be meddled with. However, notwithstanding that, I enter'd upon the difficult Task, resolving to handle this *Noli me tangere* with the greatest Precaution and Prudence I was master of.

Upon a strict Examen of these *Varices*, and weighing all their Circumstances, I began with one about the bigness of one's Fist, below the Knee: Because it lay the Fairest, and afforded the greatest hopes of Success, it being free from the Tendons and Ligaments, and having no community with the other two; and farther, I being well assur'd that upon a prudent and circumspect management the Patient could not possibly be worse. Take the method as follows; First, after having prescribed a due *Regimen*, I apply'd over the whole Knee *Emp. Defens. Vigon*. to prevent Inflammation, which was perforated according to the Circumscription of the *Varix*, where I apply'd Pledgets, arm'd with *Butyr. Antimon.* and over them a Bolter dip'd in *Aq. Litharg.* with a moderate Bandage: A few Hours after I visited my Patient again, and found him complaining of intolerable Pain, and that the whole *Apparatus* was bloody, the Bandage loosen'd part of the Tumour incrusted, and part of it in clefts; upon which I gently press'd out what Blood I could, and dress'd it up as before, rubbing the neighbouring Parts with *Ung. Alb. Camph.* All this day the Patient did not stir himself in his Bed. The

next day the Dressings look'd bloody, but removing them I found the *Varix* blackish, and crusted over, the neighbouring Parts not corroded, and the Patient pretty well at Ease; Wherefore I continued my Method 'till the fifth Day, when on my endeavouring to loosen the Eschar with my *Spatula*; there followed a great Flux of Blood, which with my Styptick I soon suppressed, and did not meddle with it for two Days, only so far as gradually to relax the Bandage: But upon the third I carefully took off the Dressings, and found a hard and black Crust, which I endeavoured to increase, and that with such Success, that in a Fortnight's time, with scarrifying the Eschar, and following the aforesaid Method, I entirely separated it without any *Hamorrhage* at all. The Ulcer being cleans'd, I proceeded to incarn, and in a short time happily cicatriz'd it, with the perfect use of the Joynr.

A *Varix* is generally defined to be the dilatation of a Vein arising (according to the Ancients) from Melancholick, black concrete Blood, (and as Moderns say) from a crass and terrestrious Blood; the first again, suppose it to proceed from an Obstruction of the Spleen; the latter from a Relaxation of the Valves of the Vein, asserting that an *Aneurism* is a preternatural Distention of the Artery, as a *Varix* is of the Vein; but how barbarous a Description is this, enough to lead young Practitioners in Surgery into Error! Though some indeed add that the Vein is not simply dilated, but somewhat contorted, and now and then forms it self into blackish Knots; but this is as trivial as the other, and falls vastly short of the Description of a true *Varix*; rather confounding it with the *Hamorrhoids*, and several other Distempers and Symptoms of these Veins and Arteries. Suppose then the Vein to be dilated in a *Varix* there is still something else in it Morbifick, besides Dilatation, which distinguishes it from other Distempers, and alters its Name and Method of Cure.

One *Varix* differs from another only in Magnitude, Place and Time, &c.

An *Aneurism* is of the same Colour with the rest of the Skin, a *Varix* is not.

An *Aneurism* is never coherent with the Skin, a *Varix* always is.

An *Aneurism* never succeeds upon Aperi-
tion, a *Varix* always does.

*Of the Hypopyon, or Purulent Eye,
with a remarkable Case.*

Hypopyon is a Collection of the Lympha-
tick Liquor of the Eye, from an internal
Cause, between its Membranes turn'd into
Pus, appearing through the *Cornea*, some-
times with a large, and sometimes lesser
Protrusion of this Coat, and neighbouring
Membranes. If it begins by Degrees, the
Pain is not intense; but if on a sudden,
very severe: In the first Case there is a
Dimness only; in the latter an entire Abol-
ition of Sight, an Inflammation, and In-
tumescence of the external Parts of the Eye-
Fever, and what not. This Affect is never
cured without Abolition of Sight, which,
besides the Suggestions of Reason, frequent
Practice has confirmed to me; for 'tis evi-
dent that in Wounds near the Eye, Matter
may work it self into the Bulb of the Eye.

Of the *Hypopyon* take this as a remarkable
Case: Some Years ago a late *Burgo-Master*
of *Amsterdam* carried me to visit a *Vintner's*
Son, living at the Place commonly called
De Geldersche Kaay, who labour'd under a
large *Hypopyon*. His Parents said it happen-
ed upon insupportable Pains and Inflamma-
tions of the External Parts of the Eye, and
increased every Day, at first with a Dim-
ness, and then an Abolition of Sight, for
which he was bled, purg'd, and had several
Cataplasms applied to his Eye: And I farther
understood by a Surgeon I caused to
be sent for, they were suppurative ones, as,
Ex Radicibus Liliorum Ungu. Basil. Far. Lin.
& fruct. Ficum, &c. The Patient a lit-
tle while before the Cataplasm was ap-
plied, could discern the Head of a Pin
from its Point, but the *Cornea* was now so
precluded, that he could not see at all, and
through Extremity of Pain behav'd himself
like a Mad Man. In the midst of these
Agonies, I told his Parents, there was no
preserving the Sight without coming to a
Manual Operation; and that without a

Speedy Performance, the Patient would en-
danger his Life. The Surgeon was against
the Operation, urging before them all, That
the Eye was a very tender Part, and there-
fore would admit of no Incision. Upon
that I made Answer, It was worse Practice
in him to promote Suppuration. The next
Day the Parents agreeing to have it open'd,
I told them, they must only expect the
Child's Life and Form of the Eye to be pre-
serv'd, but despair of the Sight; since the
Eyes could by no Means be closed for sever-
al Days, and there flow'd from the Wound
a Quantity of *Pus* and Limpid Matter. I
applied over the whole Eye the following
Medicament:

Rx Medull. Pomor. Putresc. ʒij. Croci
Brit. ʒj. Laud. Opiat. gr. v. Aqu. Hord.
mic. pan alb. q̄s. pro Cataplasmate inter
Lintheamina tepide Oculo adhibendi.

The same Day I inspected the Eye thrice,
and repeated the aforesaid Cataplasm: After
having gently press'd the Matter out, I laid
on Bolsters dip'd in *Lac. Virg.* warm'd, of
which this is the Form:

Rx Aceti acidiss. lb̄ j. coquat. cum ʒiv.
Litharge. aur. celat. adde Rad. Rub. Tinct.
ʒij. Sacch. Saturn. ʒj. Camp. gr. v. ebul-
liant horæ quadrant, filtrat, conservetur
in usum.

In the Evening the Pain abated, and the
Patient was very easy. I repeated the same
Medicines, and the next Morning found
every Thing chang'd for the better; there-
fore I continually ply'd him with Medicines
'till the next Evening, when instead of dis-
turb'g the Family with Cries, he cheer'd
them up with Smiles. When the Parents
found the Patient at ease, and his Eye every
Hour receding into its Orbit, they flatter'd
themselves with the Hopes of recovering his
Sight: But the Matter being all expell'd,
and the Ulcer consolidated, my Prognostick
prov'd true, viz. That there would be no
Deformity of the Eye, but the Loss of
Sight.

Of an Excreſcence which ſuddenly grew out of a Woman's Groin.

In the Year 1703, in the Month of *April*, one *William Beaudox*, who practiſed Surgery at *Wormonden*, came to me with *Mary Corſzem*, a Widow about Forty ſeven Years of Age, who had brought forth Five Children, and inſtead of the laſt, *An. 1707, Nov. 7.* there aroſe in her Left Groin a hard Tumour, indolent, and of the ſame Colour with the Skin. At firſt it was no bigger than a Pea, but in Time equall'd a ſmall Cheſs-Nut, till at laſt it grew to the Bigneſs of an Egg. When the aforeſaid *Beaudox* on the 19th of the ſame Month was ſent for to inſpect it, hearing that it encreaſed daily, and that it would bleed Four or Five Pints a Day, could ſcarce tell what to make of it; and the Patient living about Two Miles from him, he only ordered her ſome Stypticks, and left her for Eight Days, when ſhe ſent for him again; and to his great Amazement, in that ſhort Time he found the Tumour to be Eight Inches long, and Five Diameter. About Four Days after I was conſulted in the Caſe, to my no ſmall Surprize. When I had examin'd the Matter, I told them the Danger of it; and withal, adviſed them immediately to call in ſome other Surgeons and Phyſicians, ſince Delays might prove fatal.

On the 3d of *April*, I again examin'd the Caſe with *Alderkerk* and *Beaudox*, Surgeons, and obſerved the Tumour to be apparently encreaſed; it look'd black, and was very ſœtid. I made a diligent Enquiry into all the Circumſtances of this Swelling, that is, in what Manner it adher'd to the Groin, what Sort of Tumour it was, &c. The next Day about Seven in the Morning came *Torrenius*, *Continot*, *Alderkerk*, *Vanloo*, *Beaudox*, and ſeveral learned Phyſicians, to whom I declar'd my Opinion concerning this Excreſcence, and the Method I propos'd to cure it by, *viz.* That it was a Diſtention of one of the Inguinal Glands adhering to the Groin by a broad *Baſis*, though it did not penetrate the Capacity of the *Abdomen*. As to the proximate Cauſe of this ſudden Excreſcence, my

Opinion was, That the Inguinal Gland (the Artery being obſtructed) ſwell'd, grew hard, and continued in that State till the Blood flowing with a greater *Impetus* reſolv'd the Obſtruction, and by that Means form'd this Excreſcence. Now that ſuch a large Swelling may in this Manner, and in a few Days, be produc'd, I have evidently demonſtrated and illuſtrated by Experiments of the Peſtilential *Bubo*, *Fungus*, &c. This I back'd with another Méthod of treating this Tumour, *viz.* That it could not ſafely be taken away by Eſcaroticks, Inuſtion, or Inciſion; but that our chief Hopes might be placed in Ligatures. The aforeſaid Gentlemen therefore agreed with me, and gave their Aſſiſtance. After having brought the Excreſcence as far as poſſible from the *Abdomen*, I paſſ'd about it in a decuſſate Form, two waxed Threads, (for Silk perhaps would be apt to cut the Skin too ſoon) to the Ends of which on both Sides the Groin I fitted a *Torcular*, for the Nut of which I took care to make a Handle, that I might upon Occaſion, by this Inſtrument, ſhaped to the *Abdomen* and Groin, ſtraighten the *Pedunculus* of the Excreſcence at Diſcretion. The Tumour was now ſupported on all Sides with Bolſters, and the Ligatures compr'eſs'd from Time to Time, till from the Pain we judg'd it neceſſary to deſiſt. In the Morning I found all Things ſucceed, conſidering the Time, according to my Expectation, and that the Patient could go to Stool, and make Water, without the leaſt Trouble: Therefore I made a ſtricter Ligature; but in the Evening to prevent Inflammation and Gangreen, I uſed the following Fomentation:

Rx Herb *Abſinth.* M. iij. *Scord.* M. ij. *Marjoram* M. j. *Rad. Polypod.* ʒβ, *Spike-nard* ʒ ij. *Flor. Roſar. rub.* M. j. ʒ, *infuſ. coqu. in. Vino Rhenano aut Gall. generoſ. col. Serv. in uſum addet. parum Spirit. Vini.*

On the 7th Day I perceiv'd the Excreſcence was mightily corrupted, look'd black, and was very ſœtid; but the Patient ſleeping pretty well, I ſtraighten'd the Ligature again. On the 8th I perceiv'd the Patient was uneaſy in the Night, and coſtive, but made Water very often, tho' without the

M m m m leaſt

least Difficulty: However, by reason of her quick Pulse and high Colour, which denote a Fever, I order'd a Suppository, which wrought its desir'd Effect about Noon; and because of her Drought I would have prescrib'd some Potion, but she shewing a great Aversion to Physick, I judg'd it more expedient to defer it, than to press it upon her at this Instant. On the 9th every Thing succeeding as well as I could wish, the Patient eating with an Appetite, I observ'd about the Ligatures a *Pus* from the divided Skin, which I dress'd with a Digestive Ointment applied Warm. On the 10th the Patient slept sound all Night, after I had taken away a great Part of the black Excreescence. On the 11th came with me *Torrenius* and *Le Mair*, Surgeons, when I attempted, by straightning the Ligatures, entirely to extirpate the Excreescence, but some small *Hæmorrhage* oblig'd me to forbear. On the 12th and 13th every Thing succeeded according to the Rules of Art, and I had now greater Hopes of a good Event. I affirm'd, and was not mistaken, that we were pretty near compassing a Cure. On the 14th I observ'd that the Ligatures were circumscrib'd with a well digested Ulcer, and that the *Abdomen* and Thighs were not in the least altered. On the 15th, being the 12th after the Ligatures were made, *Alderkerk* in my Absence took off the Dressings, together with the whole Excreescence from the Groin, without the least Effusion of Blood; therefore in Order to deterge the Ulcer, he applied *Unguentum Mixtum*. In the Evening, to my great Satisfaction, I found my Patient very cheerful, and the Cure almost compleated. I design'd the next Day to make an Anatomical Enquiry into this extirpated Excreescence; but its *Fator* was so great, that I was not able to hold my Nose over it for a Minute. But what occur'd to my Observation was, that this Carnous Mass consisted of one Body, that Part excepted next the *Pudenda*, which seem'd to be divided by a *Sulcus*; whence I concluded that two or three Glands being affected might make up this great Body. On the 16th and 17th the Ulcer was so far deterg'd, that on the 18th the poor Wretch, being in perfect Health, went to

her Relations in the Village *Voorhout*. But because Mr. *Beaudox* lived nearer, we committed the cicatrizing of the Ulcer to his Care, which he managed with such Success, that on the 25th of *May*, it was almost consolidated, being dress'd only with dry Lint. I shall make no Mention of the Bandages I used, they being only suspensatory and retentive ones. However, I shall observe to you, that the Patient, during the whole Course of her Cure, took not so much as one Grain of Physick inwardly.

Of Verrucæ or Warts.

Not to mention the Opinion of every Author in this Case, I shall only say, That one defines it to be a Carnous, *Fungus*, or Wild Excreescence, indolent, and of the same Colour with the Skin; supposing it to be produc'd from a Crass Blood, separated by extraordinary Heat from the whole Mass. Another attributes its Rise to Melancholick, *Terrene*, and Phlegmatick Humours. Some again affirm it to be productive of the *Succus Alimentaris*, which being vitiated and detained in the Pores of the Skin, at last throws it self out between the solid Fibres, and so takes its Encrease. Others imagine it has its Rise from External Injuries; as from Worms, Spiders, Dirt, Corrosive Salt, &c. getting into the Pores of the Skin, and vitiating the *Succus Alimentaris*. These Opinions are to be rejected as meer Figments; for they confound with the *Verruca* several Carnous Tumours and Excreescences, as the *Thymus*, *Sycosis*, and others. That the *Verruca*, contrary to the Suggestions of Authors, appear to be an Excreescence of the Papillar Cutaneous Nerves, is evident by a Microscope. Since then this is a demonstrable Truth, I shall endeavour to be as concise as I can; but in regard that the Cutaneous Glands sometimes protrude themselves between these *Papillæ*, they look like so many Species of *Verrucæ*. But since that Disease only affects the aforesaid *Papillæ*; a *Verruca*, properly speaking, is neither Carnous, nor Glandulous, but in this Case a mix'd Sort of Excreescence.

As to the Palliative Cure of Warts by Induration, and the absolute one by Exsiccation,

cation, so as they may fall off, I shall endeavour to shew clearly, whether this may be safer and sooner effected by Medicines or Manual Operations. Although Medicines applied to the Cure of Warts in general, may likewise seem proper in particular for those of the *Palpebra*; yet I would have young Practitioners be cautious how they use them, and not take it as an Axiom, That Warts are usually consumed by Corrosive Medicines, such as *Spirit. Mercur. alb. Anzupigment. Turpith. Miner. Mercur. Precipitat. Ol. Sulph. per camp. Ol. Vitriol. Butyr. Antim. Arsen. Lap. infernal. Aq. Fort. &c.*

Now, Courteous Reader, with Submission to better Judgments, I shall chiefly give you my Opinion concerning these Medicines: And whoever thou art, be advised not to apply them to Warts of the *Palpebra*; for be they administer'd with never so much Caution, they will fret and corrode these tender Parts, to the Damage of the Eye it self: A singular Example of which I shall here produce before I lay down the Medicines I use my self.

In the Year 1690, a young Lad, about Sixteen Years of Age, had upon the right superior *Palpebra* near the Nose a large *Verruca*, and sent for a Surgeon at the *Hague*, whose Name, for his frequent Success otherwise in Practice, I shall forbear mentioning. This Surgeon, after having made slight Scarifications, applied the common Caustick, which had not been on an Hour, but the whole Eye was extremely painful: However, the Patient believing the Wart ought to be consumed, and that it could not be done without so much or more Pain, neglected to send for the Surgeon, who did not come till four Hours after. Having removed the Bandages, he took Care to keep the Eye-Lids steady, lest the Dressings should give Way, and the Causticks slip off.

He had no sooner inspected the Eye, but the *Verruca*, and almost the whole *Palpebra*, together with the Temple and Cheek on that Side, appear'd somewhat blackish: Upon wiping the Part, he examined the Case nearer, and found the *Tunica Adnata* and *Cornea* affected with the Caustick: Upon which he advis'd with me concerning the Patient. At first I endeavour'd to mitigate the Pains and Erosions with *Anodyne* Cataplasms, which put a Stop to the Malady, but Life and Vigour were wanting in the mortified Parts, and afterwards there was a small Slough from the *Palpebra* and *Tunica Adnata*, and the *Cornea* was condensed, so that the *Papilla* or *Ligamentum Ciliare* could not be discern'd through it. The whole Bulb of the Eye appeared of one Colour; being very much protruded. To conclude this Relation, I shall say no more than that the Patient had his Eye left, but lost the Sight of it; though he now and then fancied he could in some Measure discern the Light.

As to the Medicines I generally make use of my self, they are Emollients and gentle Desiccants; the former are in order to render the Warts fit for Extirpation, and the latter for their Consolidation: Thus have I us'd with good Success *Emplast. de Mucilag. Mens. Muliebr. cum spmo mixto, ceraque abduct. cum Sandrach, &c.* I know by Experience, that the Juice of Beech or Oak won't touch this Affect; for if you mix with this Juice Ink or Gall in order to destroy the Wart, both the Surgeon and Patient run a great Risk; but when they are mollified, they may be safely rooted out. But by the Way, I shall only add, That a *Verruca* is more effectually taken away by a Chirurgical Operation than any Medicament whatsoever, which Operation is threefold, viz. Ligature, Excision, and Inuision.

A

CHIRURGICAL

DISPENSATORY,

S H E W I N G

*The manner of choosng, and the Preparation of such Medicines
as are most necessary for Surgeons.*

THE best Method of curing Wounds proves unsuccessful, when such Remedies are wanting as are proper for the Disease: It is therefore expedient that a Surgeon be skill'd in preparing Medicines, in order to make Compositions, of the effect of which, he may be well assur'd; and if he has the good fortune to find them already made, he may always reflect more judiciously upon their Operations, when he knows of what they consist.

Remedies for Contusions.

IN order to reduce into the Vessels Blood when extravasated under the Skin, it is requisite at first to open a Vein in the Arm, and the next Day to order a Purgative Potion, such as the following, *viz.* Take half an Ounce of Tamarinds, two Drams of Sena, with a Dram and a half of Rhubarb, and let all be boild in a sufficient quantity of Water, till the Liquor is consumed to three Ounces, which you are to strain, dissolving therein an Ounce of Manna, and as much Syrup of Roses Solutive, to compose a

Drink, which is to be taken at one Dose. The Blood-letting and Purgation, may be alternatively repeated, while the Patient takes, from time to time, a Spoonful of Oil of sweet Almonds fresh drawn, especially if it be suspected that the internal Parts are hurt; and for the external, a Lini-ment is to be prepared of the same Oil. It would be expedient on the first Day, to apply to the affected Part; a Pledget dip'd in the White of an Egg and Vinegar of Roses, renewing that Pledget several times; and afterwards during seven or eight Days, you are to lay on a Cataplasim, compos'd of red Rose-flowers, Myrtle-berries and Leaves, of each 2 Ounces; Bean-meal, and Barley-meal, of each 1 Ounce; Wormwood half an Ounce, and the like quantity of Betony. The whole compound being boild in strong Wine, a Cataplasim is to be made of it, to which add Oil of Roses and Oil of Camomil. After that interval of time, a Plaister of Diapalma is to be made use of.

In Contusions of the Head, a Plaister of Ivy is to be apply'd, or the Part may be embrocated with Oil of St. *Johns*-wort. As for slight Contusions, it may be sufficient

to apply from time to time, beaten Salt, wrap'd up in a piece of Linnen-cloth, which must be dip'd in warm Water, as often as it is used. For Contusions where the Disorder is greater, let the Patient take a Glass of good Wine, in which is put the Root of *Caryophyllata*, Ana 1 Dram, reduced into Powder. Otherwise, let Unctions of Oil of Roses mingled with Oil of Myrtle, be laid on the wounded Part, which is to be afterward rub'd with Ointment of Alabaſter. Or else R Cows-dung and Wormwood, of each a Handful; Bran half a Handful, and Camomil-flowers 2 Ounces; with as much Oil of Camomil, as will be requisite to make a Plaister. It is also recommended to lay on the contus'd Members, an Ointment made of Honey-combs and Honey boil'd in Wine to be spread over Sheeps-leather, or on strong Cloth, which must be renew'd for three Days.

As for ordinary Contusions, with any Cut, the part that is most affected, must be bath'd with Luke-warm Wine, before you apply to the entire Part, the stamp'd Leaves and Juice of white Mullein, or the Leaves of Chervil bruised. In Contusions of the Eyes, it is expedient to boil the most tender tops of Hyssop-Leaves in common Water, or in White-wine, to be afterward laid on those Parts.

Remedies for Tumours.

TO take away the Inflammation, apply often to the Part, a Decoction of Sulphur with Urine, or the Juice of River Cray-fish Hot, or a *Lixivium* of the Ashes of Vine-branches, with Vitriol, Salt and Vinegar. If the Malady be not dispers'd by these Medicines, it must be brought to suppuration, with Milk, in which *Venice-Soap* has been boil'd; and the Tumour being open'd, is to be dress'd with Balm and a Plaister of Sulphur.

When there is only occasion for Repercussives, they must be preceded by Phlebotomy, and afterward some such Remedies as these are to be made use of, *viz.* R best Vinegar 3 Ounces; Whites of Eggs 1 Ounce and a half; red Roses pulveriz'd half a Dram, mingle all together, and soak there-

in Pledgets, to be spread upon the Part Affected. Otherwise R Ointment of Ceruſs 2 Ounces, Juice of Plantain and House-leek, of each 1 Ounce; with Rosewater 2 Ounces; a mixture of these is to be spread on Tow, with which you are to cover the Part. You may also take a more gentle Plaister, made of Oil of Roses and Milk, with Bread-crum. If the Pain be not then asswag'd, apply the following Cataplasm: Let four Handfuls of Mallows be stamp'd a little, in order to soften them, and make their Stalks Tender: Then add Barley-meal half an Ounce, with an equal quantity of Oil of Violets, Oil of Roses, and *Unguentum Populeum*; as much as is needful to give a consistence to the Cataplasm; for the want of which Medicine, this other may be prepar'd. Boil a sufficient quantity of Wheat-flower in Water, adding Oil of Roses at Discretion, and a little Saffron.

To abate the Tention, and insensibly dissolve the Matter, R Meal of Linseed and Fenugreek, Aniseed, Camomil-flowers, Melilot and Marshmallows, as much as is requisite: Let them be boil'd and stamp'd, that they may incorporate with the Mucilage of Marsh-mallowseed and fresh Butter; to which Bean-meal may be afterwards added. When Resolvents prove unsuccessful, recourse may be had to suppuratives, such as the following Plaister, R Mallow-roots, and Violet leaves, of each a Handful and a half; Marsh-mallow-roots cut small 2 Ounces, white Lilly-roots 1 Ounce and a half: Let these Ingredients boil in Water, to the Consumption of one half: Then add Mucilage of Cabbage-seed 1 Ounce and a half, Wheat-flower half an Ounce, Leaven 1 Ounce, Hoggs-lard, Fresh-butter, Breast-Milk, of each 1 Ounce; Oil of white Lillies, and sweet Almonds, of each a sufficient Quantity, to bring the Cataplasm to a due Consistence, which must be laid hot on the diseased Part. Or R Cows-milk one Pint, and Bread-crum grated fine 1 Pound, Cabbage-Juice 3 Ounces. Saffron half a Dram, Oil of white Lillies 3 Ounces: Make a mixture of these, and apply it hot to the Part.

When

When the Phlegmon is ripe, which may be perceived by the ceasing of the Pain, the relaxation of the Part, and the fluctuation of the Matter; due Preparation must be made to open it, by other means than the Incision-knife, and Fire or Causticks, which too much terrifie a Patient; in such cases, the following Remedies may be used & simple *Diachylum* 2 Ounces, Leaven 1 Ounce, Oil of sweet Almonds half an Ounce; mingle these Ingredients together grossly, and spread them on Leather, putting Pigeons dung pulveriz'd fine 1 Dram, in the middle of the Plaster, and apply it to the Phlegmon, or else & Leaven half an Ounce, Salt 1 Ounce, strong Vinegar 2 Ounces, and four *Cantharides* pulveriz'd: Pound these Ingredients in a Mortar, till they come to the consistence of Paste; and lay *Ana* half a Dram on the Aposteme, which is to be cover'd again with the preceding Plaster. The Tumour being open'd is to be dress'd with this Ointment: Let Turpentine 2 Ounces be well beaten with the Yelk of an Egg, spread some of it upon the Lint you are to put before the Aperture, and cover with the same Ointment, the entire Tumour; which is afterward to be bound up somewhat loosely, to digest the rest of the Matter, and preserve the natural Tone of the Member. At the end of some Days, all the Matter being Evacuated, the Wound is to be cleans'd with a mixture of Turpentine 2 Ounces, and Honey 1 Ounce; which may serve for several times, always taking care to cover this Medicine again, with the abovemention'd Digestive.

To incarnate and consolidate the Ulcer, & Turpentine 2 Ounces, Honey 1 Ounce and a half; Frankincense, Myrrh, Mastic, Aloes, of each 1 Dram; *Sarcocolla* half a Dram, pulverize that which requires it; and pound all thoroughly with a Pestle, to make an Ointment. If the Pain encreases, put in Anodynes or Narcoticks, among which Henbane is of singular use; the Leaves of which are to be laid under hot Arches, and mingled with fresh Boars-grease, to be used in a Cataplasin. Balm of Sulphur is also very profitable in this case: The Part is to be rub'd with it Morning, Noon and Night, and afterwards cover'd

with fine Rags bound lightly round about As for a particular Remedy of the same Virtue, which serves to mollifie, suppurate, open, cleanse and consolidate, no better can be found than *Rulandus's Emplastrum Diaphysum*, which is made thus. & Oil of Sulphur 3 Ounces, Wax half an Ounce, *Colophonia* 3 Drams, and Myrrh 4 Ounces 7 Drams; the Wax and *Colophonia* being melted with Oil, and intermix'd; some Myrrh beaten fine is to be strow'd thereon, and the whole boild by degrees over a gentle Fire, stirring the compound continually with a *Spatula*; in the space of a quarter of an Hour take it from the Fire, and set it by to cool slowly.

If there be ground to fear lest the Tumour having obstinately resisted the usual Discutients and Resolvents, thou d degenerate into a *Scirrhus*, take the following Cataplasin. Roots of Lillies and Marshmallows, of each 1 Ounce and a half; Roots of Bryony, *Cyclaminum* and wild Cucumber, of each 2 Ounces, boil all these in a sufficient quantity of White-wine; and having stamp'd them, add Dung of Pigeons and Goats, of each 1 Ounce and a half Sal Armoniac dissolv'd in distill'd Vinegar, *Bdellium* and *Opopanax* dissolv'd in Oil of *Sesamum*, of each 1 Ounce; *Landanum* and Liquid *Syrax*, of each 1 Dram; with a sufficient quantity of Ship-pitch, to make it up into a Plaster. But if the Part be in danger of Putrefaction, it must be wash'd with Salt Water, in order to apply thereto Bean-meal and *Orobia*, of each 2 Drams, boild in Oxymel.

When extravasated Blood is spread about under the Skin, the affected Part is to be often embrocated with Spirit of Wine rectify'd and impregnated with Camphire or Saffron; or else with Sal Armoniac prepar'd in Spirit of Wine: Balsam of *Pernu* mix'd with the Yelk of an Egg, and Spirit of Wine is also proper for it, especially in the Nervous Parts; as well as Decoctions or Cataplasins, made with the Roots of *Symphitum*, *Solomon's Seal*, Melilot; Flowers of Elder and Camomil, and Saffron boild in Wine. In case the Suffusion be more considerable, it must be brought to Suppuration; and upon danger of a Gangrene, scarifie the

the Part deep, and apply *Unguentum Egyptiacum*, with Digestives, as that of Turpentine, the Yolk of an Egg and Honey, with some drops of Spirit of Wine or Brandy.

For an *Erysipelas*, or St. Anthony's Fire, the Patient is to take Elder-bark inwardly, and outwardly apply Camphire and Saffron infus'd in Spirit of Wine, Carps-gall, Treacle with Salt of Wormwood, a Decoction of *Olibanum* and Myrrh, with Camphire and Saffron. If by the inconsiderate use of cold and astringent Medicines, the *Erysipelas* be chang'd into an Ulcer, an Ointment may be us'd to good purpose, made of Litharge 3 Ounces, *Unguentum Populeum*, Cerus and Galen's Refrigerative, of each 1 Ounce and a half; with Oil of Roses 1 Ounce, all well mix'd together in a Leaden Mortar. If the Patient labours under excessive Heat and Pain, apply to the Part Pledgets soak'd in an infusion of *Saccharum Saturni* 1 Dram, Camphire 2 Scruples, *Opium* 20 gr. and Myrrh 4 Drams, in a Pint of Whitewine, taking care often to repeat the soaking of the Pledgets, with the same Compound.

This Disease (which consists of an Expulsion, that the Blood makes of its most vivid unctuous Particles, to some Part of the Body where the Skin is finest or most irritated) is often cur'd by causing the Patient, from time to time, to take fasting, Red Cows-milk, *Ana* 8 or 9 Ounces, in which fresh or dry Elder-flowers have been boil'd over a gentle Fire; and this ill Disposition of the Blood may be corrected by the following Electuary & Treacle 1 Ounce, Bole Armoniack prepared, or *Terra Sigillata* 4 Scruples, Juniper-berries, Tormentil-root, *Cardus Benedictus* Seed, of each half a Dram; *Electuarium de Gemmis*, and *Diamargaritum*, of each 1 Scruple; raspings of Ivory or Hart's Horn, Sorrel-seed, red Coral prepar'd, of each half a Dram, with a sufficient quantity of Syrup of Lemmons; to make the Electuary Liquid; a Dram, or 1 Dram and a half, of which may be given as a Dose, according to the Constitution of the Patient; who is to take this Medicine, in some Ounces of the distilled Water of Succory, *Cardus Benedictus*, or Scabious, in order to evacuate by a gentle Sweat, this

subtil Humour, which remains separated from the Mass of others in the Surface of the Body.

When *Erysipelas*'s first begin to arise, some prescribe an-application of cold and moist Medicines; as the Juices of *Solanum* and House-leek, till the red Colour be taken off, and then lay on Pledgets heated, and dry'd in the Shade, after they have been soak'd in a Liquor made of Scabious and white Venice-Soap dissolv'd therein. Some have preserv'd, and even cur'd themselves of this Disease, by eating for nine Days or more, every Morning in the Month of May, part of a Cake, compos'd of Wormwood-Tops, Leaves of Dandelion and common Germander, cut small and mix'd in a New-laid Egg, with a little Butter or Olive Oil. It is also approv'd to apply after the General Remedies; Leaves of Ivy or Coltsfoot boil'd in Water: The Leaves and small Branches of Savin grossly pulveriz'd, and strew'd over the Fire, to make a Fumigation three or four times a Day about the diseased Member, have often effected a Cure: And when the part is ulcerated, it is advisable to cover it with Virgins-Wax, mollified with the Hands in warm Water, and spread in form of a Plaster. Fomentations made with Pledgets, soak'd in a mixture of Water and Milk, or Brandy heated, are also us'd to very good purpose.

Serous Tumours without Pain, that proceed from an Obstruction in the course of the *Lympha*, are to be dress'd with Water, in which Quicklime has been steep'd, and a mixture of Brandy: You are also to apply a Plaster of Bay-berries, with Oil, Goat's Dung and Honey, while the Patient takes inwardly, Decoctions of the Wood of Juniper and Sassafras.

Oedema's or *White Swellings* which are produc'd by a more viscous Serosity are cur'd with Plaisters of Bayberries, and distilled Oil of Amber renew'd twice a Day; or else with Cataplasms of Rosemary, Juniper-Berries, Organy and Camomil in a *Lixivum*, of the Ashes of Vine-branches, with some common Sugar boil'd therein. Cataplasms may be also us'd that are made of Camomil, St. John's Wort, Sage, Wall-Wort, Pellitory of the Wall, Bryony-Root and

and Onions, all boil'd in White Wine, with Honey. Otherwise, a Remedy may be prepar'd with Goat's Dung, and Man's Urine.

Scrofula's or King's Evil Swellings, are glandulous Tumours that take deep Root; they usually arise in the Glands of the Neck, Armpits, Groin or Breasts, and are caused by phlegmatick Humours which grow thick as Plaister, and make an obstruction in the Ducts or Canals of the Body; therefore this Matter must be dispers'd and dissolv'd, or else evacuated by Suppuration. Scrofulous Tumours are dissolv'd by Oil of Lizards prepar'd with Vinegar, or a Cataplasm of Gum Armoniack and Hemlock, or else they are brought to suppuration by a Mellilot Plaister compounded with Oil of sweet Almonds and Snakes Grease; *Angelus Sala's* Magnetick Plaister mix'd with *Emplastrum Diasulphuris* is also of good use. When the Abscess is open'd, apply the Digestive, with Mercury Precipitate, in order to cleanse it afterwards with Balsam of Sulphur, or else with the Mundificative of Smallage, *Unguentum Apostolorum*, *Egyptiacum*, and *Dia-chylum*.

It will be proper for Persons troubled with the King's Evil to take the following Pills every Morning for forty Days. R *Euphorbium*, Ginger, Turbith, the Juice of Orrice Root and Agarick, of each half a Dram, and having pounded the whole Mass, make it up into forty Pills, one of which is to be taken every Day. The Patient may also be purg'd with the following Potion, to be drank at three Doses: Make a Decoction of *Guaiacum* 4 Ounces, Sarsaparilla half an Ounce Betony-Leaves a Handful, Ellecampane-Root 2 Drams, Sena-Leaves 1 Ounce and a half, *Carthamus*-Seed 1 Ounce, Aniseed 2 Drams, Fennel-Seed 1 Dram, and in half a Pint of the Liquor dissolve Agarick 3 Drams, Ginger 1 Dram, and Cinnamon 1 Dram and a half; when all is well strained, add Syrup of Roses Solutive 2 Ounces, to compleat the Potion. The Purgation being over, prescribe a Bolus made of conserve of Marjoram half a Dram, Treacle 1 Dram. Some likewise order the Patient to take Fasting, Powder of Sponge dry'd in an Oven; adding a little Sugar and Spice. Mr. Boyle re-

commends the Herb *Paronychia* or Rue-Whitlow Grass, infus'd in Beer, to be drunk during some Days. Spirit of *Sal Armoniack* is also made use of to good purpose in this Distemper: The Powder of Broom Flowers strew'd on Victuals and Drink likewise produces a singular Effect; as well as a Decoction of Female Southernwood in Whitewine, or an infusion of a Handful of Rosemary, and the like quantity of Harts Tongue in two Quarts of Whitewine during 24 Hours, to be taken eight Spoonfuls at a time twice a Day.

In the mean while, the following Ointment is to be apply'd outwardly, viz. R red Arsenick 2 Drams, Sublimate half a Dram, Roots of Serpentry, Betony, and Sowbread, of each half an Ounce; *Aloes*, *Hepatick* 1 Ounce; pulverize all these Drugs, and make an Ointment of them with Boars Grease. An Ointment made of the Marrow of a Leg of Veal 2 Ounces, fresh Butter half an Ounce, and the same quantity of Marshmallows, may be also us'd to more Advantage. There is likewise a great deal of virtue in this Plaister: R *Ammoniack* and *Galbanum* dissolv'd in Vinegar, of each 1 Ounce, *Bdellium* half an Ounce, Harts-Marrow, and Goose Grease, of each 1 Ounce and a half; Mucilage of Marshmallows, Fenugreek, and Linseed, of each 2 Ounces, Litharge half an Ounce, Orrice Root pulveriz'd 1 Ounce; Oil of Anis and Wax an equal Part, as much as is requisite to make up the Plaister. Or else take Seeds of Mustard, Nettle, Sea-foam, Roots of round Birthwort and Bartram, of each half a Dram, Squills prepar'd, *Coloquintida*-Husks 1 Scruple, and *Sulphur vivum* 1 Dram. These Ingredients being well pulveriz'd add Gum *Ammoniack* and *Bdellium* dissolv'd in strong Vinegar, of each half a Dram, with a little Wax and Oil of Lillies, to give it the consistence of a Plaister; which being spread on Leather is to be apply'd to the Part Affected; but before the Application is made, it may be fomented with this Decoction. Take fresh Leaves of red Cabbage; Leaves of Henbane, Celandine, dead Nettle, Pimpernel, of each a Handful; Horle-Radish Root 1 Ounce, and round Birthwort-Root half an Ounce;

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cut all these Herbs, and boil them in Vinegar of Roses.

Otherwise take Brandy 1 Ounce and a half, Camomil Flowers half a Dram, Fenugreek Seed one Dram, Lavender half a Dram; Let these Drugs be mix'd and boil'd a little, in order to stain the Decoction, with which you are to foment the part hot with a Sponge, during the Night. After this Remedy, the following Plaister will be requisite: Take Mustard Seed 1 Dram, Nettle Seed half a Dram, *Sulphur vivum*, 1 Dram and a half, Gum Ammoniack dissolv'd in Brandy 2 Drams, *Diachylum* Plaister mix'd with Orrice 3 Drams; mollifie these with Oil of Lillies, and make up the Plaister. Otherwise, this Cataplasim may be apply'd: Take Orrice Root 4 Ounces cut finall, to make a Decoction in Whitewine; and when you have stamp'd this Root so boil'd, add Beanmeal and Barley, of each 2 Ounces and a half, with Honey 4 Ounces, to mingle all together: But it is necessary, before the Cataplasim is made use of, to rub the Scrofulous Tumours with this Liniment; Take Oil of Lillies and Sowthistle, of each 1 Ounce, juice of Orrice Root half an Ounce, Brandy 2 Drams; boil the Juice with the Oils, and add some Gum Ammoniack dissolv'd in Vinegar, to compose the Liniment.

When these Tumours are open'd, nothing is more proper than the following Medicine. Take Oil of Bays 1 Ounce and a half, Cerufs pulveriz'd, and dulcified with Brandy, 1 Ounce, Roche-allum half an Ounce, common Salt 2 Drams, and make a mixture of the whole. Or else take the Leaves of Tobacco bruiz'd, when that Herb is in Flower; otherwise make a kind of Glue with Meal-dust and Vinegar, to be boil'd over a gentle Fire; and when it is come to a moderate Consistence, spread it upon a Pledget of new Cloth, to cover the Ulcer: This Application is to be renew'd every twelve Hours, to draw out a great deal of Matter; and when the Tumour will yield no more, you are to apply a Plaister of *Basilicon*, and afterwards of *Diapalma*. Others to consume the scrofulous Gland, prepare an Ointment, with equal quantities of Turpentine, Yolks of Eggs, and Honey, beaten

together, and for internal Remedies, make use of this Potion. Take *Scrofularia*, *Filipendula*, Burnet, Broom Flowers, *Pilosella*, red Cabbage, Agrimony, of each one Handful; round Birthwort, Roots of *Spatula fetida*, and Horseradish, of each 1 Ounce, Ellectampane half an Ounce, Coriander Seed 1 Dram and a half; let all be boil'd in two Pints and a half of a Liquor, compos'd of two Parts Wine, and one part Water; sweetning the Decoction with Sugar, to be taken instead of common Drink.

The *Scirrhus* is a hard Swelling, almost without Pain, and of an equal Colour throughout its whole Extent: It is form'd of an inward and depraved mixture of Fibres and Canals, which lie so close together, that the Humours therein are coagulated. This Tumour may be mollified and dissolv'd by an Application of the Plaister of *Vigo*, with *Mercurius Dulcis*, or a Plate of Lead spread over with Mercury; or with a Plaister of Hemlock, with Sal Armoniack; those of Mandrake, Tobacco, and wild Cucumber; or a Cataplasim made of the Leaves of Violets, Mallows, Marshmallows, Beets, Elder, Rue, Wormwood, with Camomil Flowers, Lilly Roots, and the Dung of a Horse and Cow; all these are to be boil'd in Wine; adding Honey and Hog's Lard, and the Cataplasim made with Bread-crum: Plaisters of Melilot and Mucilages mix'd with Oil of Earthworms and Flowers of Sulphur; and even Oil of Tobacco, and Gum Ammoniack dissolv'd in Vinegar, &c. are all very effectual Remedies.

Some Practitioners in Surgery, order a very regular Diet during the whole course of the Cure, and the use of such Food as affords good Juice. They prescribe Syrups of Fumitory and *Epythymum*, and Purgatives of Sena; afterwards they apply the following Cerates. Take Grease of a Goose, Duck and Pullet, of each 3 Drams, Ammoniack dissolv'd in Vinegar 1 Ounce; *Bdellium* and *Galbanum*, of each 1 Dram; Plaisters of Marshmallows and Melilot, of each half a Dram: Let these Drugs be boil'd with the Mucilages of Linseed, Fenugreek and Marshmallows 1 Ounce and a half, till they come to the consistence of a Cerate. Another Medicine may be compounded thus: Take

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white *Diachylum*, Gum prepar'd with Marsh-mallows, and *Unguentum Agrippæ*, of each 2 Drains; Oil of white Lillies 1 Dram; Ducks Grease 2 Drains: Make the Dissolution and Mixture of all over the Fire; adding Ammoniack, *Bdellium*, and *Laudanum*, of each 1 Scruple, and dissolve the compound in Vinegar, in order to make the Cerate: Or else to dissolve these sorts of hard Tumours, apply this Plaister. Take Seeds of Mustard and Nettles, Sulphur, Sea-foam, Birthwort, *Bdellium* Ammoniack, Oil of Anis, of each an equal Quantity; and make a Plaister of them, with Wax and a little Vinegar. This Medicine often effects a Cure in the space of eight Days, when it is renew'd twice or thrice during that Interval.

But when the *Scirrhus* is about to change into a Cancer, the following Plaister is to be prepar'd: Take Tutty 2 Scruples, burnt Lead 1 Dram, Litharge, Quick-silver 1 Dram, Juice of Plantain, Centinody, Night-shade, of each half an Ounce: These Ingredients are to be boil'd to the Consumption of the Juices, and afterward well pounded in a leaden Mortar, to give them a brown Colour: Sometimes the Practice proves successful, when after the general Remedies Suffumigations are made under the part Affected, that has been sprinkled with Vinegar, and out of which it is design'd to draw Sweat; afterward it is to be cover'd with a Plaister of Mucilages, and that succeeded by another Plaister of Ammoniack, which compleats the Cure. Some disperse this Malady, with Cow's Dung boil'd on the Tumour, to dissolve it. Or else they cover the *Scirrhus*, with a Cataplasim made of Barley Meal, and Bran, of each 2 Ounces; Goat's Dung 3 Ounces, Melilot and Camomil, of each half a Handful: The whole being boil'd in a *Lixivium*; add hot Wine, and a little Oil of Roses, to give it the form of a Medicine.

The Cancer depends not only upon a vicious ranging, and a too compact texture of the Fibers and Canals as the *Scirrhus*, but even upon a Disposition of the Pores proper to corrupt the Juices, and render them Caustick and Corroding. For an *Occult Cancer*, a Plaister is to be made with Powder of Lead, Oil of Roses, and Saffron beaten together; and when this Tumour

is ulcerated or manifest, a Plaister of Frogs, may be prepar'd with Hart's Horn and Lead, pounded together in a leaden Mortar, with a hot leaden Pestle. Ointment of Tutty and *Diapompholyx* are also proper for this use; or else take Juice of *Solanum* 8 Ounces depurated and stirr'd about in a leaden Mortar: Add to these common Tutty 2 Drains, wash'd 8 or 10 times in Night-shade Water; Lead 1 Dram, burnt and wash'd in like manner; and Oil of Roses half an Ounce, all intermix'd in a leaden Mortar, to make a Liniment: The calcin'd Powders of Toads, Moles, Frogs, and Crayfish, serve to mundify, as well as the Broth of Vipers, and Cray-fish, Lime-water, or Whay boil'd with Chervil, to which is added Camphire or Sugar of *Saturn*. It is also order'd to take inwardly the Powders of Crabs-eyes, Vipers, *Millipedes*, and other sweet *Alkali's*.

To destroy *Fungus's*, or soft and whitish Swellings, that generally grow round about the Joynts, where Membranes and Tendons are hurt; they must be cover'd with desiccating Powders, made of Harts-horn burnt, Myrrh and *Pompholyx*; or else Mercury Precipitate.

As for *Encysted Tumours*, where the Matter is contain'd in a particular Bag, they must be dissolv'd, and that Bag extirpated. Take Rosemary, Elder, Sage, Wormwood, great Chelidony, Camomile, Melilot, St. John's-wort and Tobacco, which are to be boil'd in White-wine, with Chimney Soot and Mercurial Honey; adding Cummin-seed beaten, and Oil of Worms; of these make a Cataplasim, to be renew'd twice a Day. Otherwise, take an equal quantity of the Plaisters of *Diachylum*, and of *Vigo*, and four times as much of Plaister of Mercury and *Emplastrum Divinum*: Let these be dissolv'd together, and mingled with Saffron and Oil of Tobacco, in order to make a Plaister, to be spread on a piece of Leather, which is to continue on the Tumour for the space of eight Days: Then the Plaister must be taken off, to renew it with fresh Matter, and laid on again for Eight Days, after having wash'd and bath'd the Tumour with hot Urine or Brine. The Matter of these Tumours may be also dissolv'd with the following Medicine. Take fresh black Pitch

6 Ounces, Ashes of Oak or Elm 2 Ounces, Spunge burnt 1 Ounce and a half, and half a Glaſs of Vinegar: The whole being boil'd over a gentle Fire in an earthen Pot, to the entire conſumption of the Vinegar, will make an Ointment which is to be ſpread upon ſoft Leather, and apply'd to the Tumour; from which you are to take off the Plaiſter every Day, and wipe off the Humour that iſſues out taking care to renew the Ointment from time to time.

To diſſipate the hardeſt Tumours, ſuch as the moſt part of thoſe that are call'd *Lupus*'s or Cancers in the Thighs, it is often ſufficient, to keep on the Part for 8 Days, a Plate of Lead rubb'd with Quick-ſilver, or elſe a Cataplaſm made of Sorrel Leaves, wrap'd up in wet Paper, and laid under Aſhes, and afterward mingled with the ſame Aſhes. But when the Matter of the Tumour is thick like Plaiſter and hard; there is no other Remedy, but to extract it by Inciſions made in the Skin; otherwiſe the bottom of the Tumour may be ty'd round about with a String, which is to be drawn cloſe, from time to time, till the Humours are abſolutely hinder'd from paſſing in, to nourish it, to the end that by this means it may be dry'd, and fall off.

The *Ganglion* is another kind of Tumour, hard and without Pain, uſually cauſ'd by a Blow, by over-hard Labour, or by ſome great Strain, which making a violent Extenſion, in the Tendinous or Membranous Parts, gives occaſion to the overflowing of a Juice that ſettles and grows hard, under thoſe Parts, it may be mollify'd and diſſolv'd by the following Cerate: Take *Oxy-croceum* 1 Ounce, *Ammoniack* and *Bellium* diſſolv'd in Brandy, of each 2 Drams; *Orrice* 1 Scruple, and three Earth-worms waſh'd with, and diſſolv'd in Wine: Mingle all theſe Ingredients with a little Oil of Turpentine and new Wax, and ſpread the compound on a piece of Leather, in order to cover the Tumour, which muſt be bound up hard; and having loos'd the Bandage, at the end of 4 or 5 Days, to take off that Cerate, you are to make under the Part, a Fumigation of Vinegar, wherein Savoury or Origan has been boil'd; which is to be ſet for that purpoſe, over a Pan of Coals, or

on Stones, heated Red-hot in the Fire: Otherwiſe, (if you pleaſe) rub the Tumour with the Juice of Rue mix'd with Brandy, and ſoak therein Pledgets, with which you are to keep the Part cover'd.

The *Aneurism*, which proceeds for the moſt part, from a Wound or Oriſce, made in an Artery prick'd inſtead of a Vein, may be cur'd by the Application of a Plate of Lead kept cloſe on the Tumour, by means of a ſtrong Ligature, taking care to make Phlebotomies by opening the oppoſite Vein: Or elſe, apply a Plaiſter made of the Powders of Sumach, *Hypocyſtis*, Aloes, Dragon's Blood and Frankincence, of each an equal Quantity; mix'd with the white of an Egg: If the Tumour continue to riſe, the Surgeon muſt preſs the Branches that proceed from the Axillary Artery in the Arm, till no Pulſe or Beating be felt in the Wriſt. Afterward having made a long Inciſion, to take out the grumous Blood that lies round the Tumour, he is likewiſe to preſs the open Artery, and apply to it little round Pellets of white Vitriol wrap'd up in Cotton, and then ſtrew over them Powder of *Sarcocolla*, *Colophonia* and Roſin ſtrain'd thro' a Canvaſs Sieve, applying thereto Bolſters with a cloſe Bandage over all: The Vitriol being liquify'd by the Blood which ſoaks thro', will by little and little, corrode the edges of the Wound, which will cloſe again; the Vitriol Pellets are to be left till they fall off themſelves, as it happens, after the Artery is conſolidated.

It is alſo adviſed in order to diſperſe the *Aneurism*, to apply the following Cerate or Plaiſter. Take Iron-droſs 5 Drams, Mummy, *Tragacanth*, Gum Arabick, of each 3 Drams; Frankincenſe, *Acacia*, Sandarack, of each 1 Dram and a half, Mouth-glue, Gall-nuts and Cypreſs, of each 1 Ounce; Oak-Miſletoe 3 Ounces, Plaiſter 2 Ounces, and Roſin 1 Pound and a half. A Cerate is to be compos'd of all theſe Drugs, with the Juice of great Comfrey and red Wax: And to make the Plaiſter, take *Emplaſtrum Diacalciticos* 2 Ounces, Powders of Maſtich, red Roſes, and Myrtleberries, and Root of great Comfrey, of each 1 Dram; with a ſufficient quantity of Oil of Roſes. This Medicine being apply'd, you are to lay over

it a Plaister of Linnen in several Folds, which is to be bound hard upon the Part, to stop the flowing in of the Blood.

Varices which are Tumours made by Veins, when their Coats are relaxed by some Division of the Fibers, or too much extended by Strains; are cur'd, if after having evacuated the gross Blood (which is sometimes contain'd therein) by light Punctures, a Plate of Lead be laid on the Part: Or else, if a Cataplasim be us'd, made of Lupine-meal 1 Pound, Goats-dung dry'd 3 Pounds, and a sufficient quantity of Vinegar, moderately strong, in which a piece of Steel made Red-hot in the Fire, has been quench'd five or six times. In *Varices* of the Ribs, *Fernelius* recommends a Fomentation of Roche-allum, in very strong Vinegar, and a close Ligature made over the Part. Some make use of a Medicine, compos'd of *Bolus Armena*, Dragons-blood, Mastich, Gumdragon, all macerated in Pomegranate-wine, to be afterward made up in form of a Candle; which they apply longways to the whole extent of the swoln part of the Vein; causing this Medicine to be kept on, by a kind of Gutter fasten'd to the Part.

Remedies for Luxations.

When the Part has been set again, after a considerable Luxation, and there remains a Tumour round about the Joynt; let that Part be anointed, with distilled and rectified Oil of Tartar and Humane Bones, with Harts-horn or Quick-lime; and to strengthen the Member, you are to moisten, from time to time, the Pledgets, Bandages and Bolsters with Wine; into which has been put a Decoction of the Flowers of St. John's Wort, Camomile, Rosemary and *Stæchas Arabica*. But if the Luxation was made by a Mass of a Plastry Humour fix'd in the Joynt; it is requisite to rub the Part with *Petroleum*, or Balsam of *Pern* dissolv'd in the Yolk of an Egg, adding thereto Spirit of Juniper. Or else take a Plaister of Amber and Gum *Elemi*, with Wax and Rosin; or *Crollius's* Styptick Plaister, malaxated with the Oil of Philosophers.

When the Luxation happens by the Re-

laxation of the Ligaments, the Patient must take inwardly Medicines prepar'd with Sassafras, Spirit of Sal Armoniac, *Poterius's Aurum Diaphoreticum*, and for outward Applications, the Spirit and Liquor of Earth-worms, adding moderate Astringents: Or else, apply *Crollius's* Styptick Plaister malaxated with *Petroleum*: Or a Plaister of *Tacamahacca* and *Caranna*, with distilled Oil of Amber.

Remedies for Fractures.

If there be an Inflammation, it is needful, to cure it, before you meddle with the Fracture. The parts of the Bone, being set again in their proper places, the fractured Part is to be embrocated with Spirit of Wine, to which is added a third part of Spirit of Earth-worms: Honey temper'd with Spirit of Wine is also serviceable, when there is a Contusion, as well as Unctions with Oil of St. John's-wort and Earth-worms, refin'd by means of distilled Oil of Turpentine and Rosemary. Afterward you are to apply a Plaister made of the Root of Goats-beard pulveriz'd, and an extract of round Birth-wort, prepar'd with Spirit of Wine impregnated with Amber; to which is added white Rosin, Turpentine and Wax, which is to be malaxated with Balsam of *Pern*, or distilled Oil of Amber, at the time when this Remedy is us'd. Three or Four Days after, the Bandages are to be taken off, to bathe the Part with the Juices of Vervine and Vulnerary Herbs. In case the Ligaments, with the Nervous and Tendinous Parts have undergone violent Contorsions, and chang'd their Place; after the seventh Day, a Cerate is to be apply'd, made of the Root of Solomon's-Seal 4 Ounces, *Alchymilla* 1 Ounce, and Plantain-leaves 2 Handfuls: And having boil'd these Herbs to the consistence of Pap, add a sufficient quantity of white Wax, to make a soft Cerate, which is to be mix'd with Oil of Myrtleberries 2 Ounces, Oil of Turpentine 1 Ounce and a half, Ointment of Marshmallows 1 Ounce, *Bolus Armena* 6 Drains, Dragons-blood 3 Drains, Frankincence 1 Dram, all mingled together.

A Simple *Fissure*, newly made, is easily cur'd with a Plaister of *Symphitum*, and if an Abscess arise in the Part, it must be open'd when ripe, in the place of the Crack, in order to take away the *Caries*, by strewing upon it Powder of *Euphorbium*, or else by sprinkling it with distilled Oil of Cloves. When there is no ground to suspect that any splinter of the Bone laid bare, is separated, the edges of the Cavity are to be joyn'd together, as soon as possible, by the means of Glue. For the rest, the generation of a good *Callus* in the fractur'd or crack'd Bones, is to be promoted by causing the Patient to take internal Vulneraries; such as Agrimony, great Comfrey, *Geranium*, and Savin; to which Rosemary must be always added; as well as *Osteocolla*, taken Fasting, to the quantity of 1 Dram, or in a Decoction of *Vinca Peruvina*. The Juice of Cowslip or Primrose, taken with the Juice or Powder of Agrimony Root, as well as the most part of viscous Aliments are also proper upon this Occasion.

Otherwise, let the Patient take every Day Fasting, of the following Powder 2 Drams, in Broth or Meat. Take *Osteocolla* well prepar'd 1 Ounce, choice Cinnamon 3 Drams, and Sugar 2 Ounces; let all be pulveriz'd and mix'd together. During the use of this Remedy, the Part is to be anointed with this Liniment. Take Oil of Earth-worms 2 Ounces, Oil of Juniperberries 2 Drams, Juice of Earth-worms 1 Ounce; mingle these together, and after having anointed the Part with this Compound, apply a Plaister compos'd of the Plaister of *Vigo* for Fractures 2 Ounces; *Oxyrocenum* half an Ounce, *Osteocolla* prepar'd 1 Ounce and a half, and Powder of Earth-worms 1 Ounce, with a sufficient quantity of Oil of Earth-worms. This Medicine is to be renew'd at the Expiration of three or four Days successively, and the rest of the Part that is not cover'd, anointed every Day, with the Liniment just now prescrib'd. The following Plaister is also much esteem'd. Take Meal of Beans, Peas, Barley, and Mealdust, of each half an Ounce; Mastich, Gum-dragon, Gum-arabick, Mummy; *Bolus Armena*, Myrtle-berries pulveriz'd, of each 3 Drams; five whites of

Eggs, beaten in strong Styptick Wine, with as much Plantane Juice, as may serve to incorporate the Mixture. After the Application of this Plaister, which is of an Astringent and strengthening Quality, a Pledget dip'd in Oil of Roses, may be laid near the Fracture. The following Plaister is likewise of singular Use. Take the whites of four Eggs, Oils of Myrtles and Roses, of each 2 Ounces, clear Turpentine 1 Ounce and a half, Myrrh and Aloes, of each 2 Drams; Dragons-blood and *Bolus Armena*, of each half a Dram; Meal dust 3 Ounces; and let all be well mingled together.

When the *Callus* is of a just Quantity, and it only remains to settle it well in order to support the Parts of the Bones that are set together again, this Plaister is to be apply'd. Take Oil of Roses 2 Ounces, Wax 3 Ounces and a half, Rosin pulveriz'd 3 Ounces, *Colophonia*, Mastich and Frankincence, of each half an Ounce, Cypress-Nuts, and Root of *Rubia Tinctorum*, of each 1 Dram, and Saffron half a Dram: Make a mixture of all these Drugs, and spread it upon Pledgets, to be laid upon the fractured Part.

Remedies for Wounds.

When the Wounds are recent, Sutures are to be made; or rather, the divided Parts, must be gently drawn together, and kept in their natural Position, by means of a Glue made of Gum-dragon, Gum-arabick, Mastich, Frankincense and *Sarcocolla*, of each 1 Scruple; all pulveriz'd and stir'd about with the white of an Egg: Let this mixture be spread on a Pledget, and apply'd to the edges of the Wound that is clos'd, when the case will admit of it: In the mean while, the Patient is to take inwardly, Crabs-eyes and *Antimonium Diaphoreticum*; and if a Fever intervene let him make use of a mixture of Nitre and Antimony, or a Decoction of Vulnerary Herbs; as *Achymilla*, St. John's Wort, Ground-ivy, *Veronica*, Wormwood, Centory, Bugle, Sannicle, &c. For a speedy Cure, it is expedient to wash the Wound with Spirit of Wine, and then apply Powder of Aloes Hepatick.

on Cotton, impregnated with Oil of St. *John's-wort*, laying the following Liniment over it. Take Benzoin 1 Ounce, Brandy 1 Ounce and a half, Mastich 1 Dram, and black Balsam half an Ounce; and make the Liniment, which is proper to cicatrize simple recent Wounds. The following Water is much esteem'd, to wash all sorts of Wounds, and soak the Pledgets with which they are cover'd. Take Brandy well rectify'd three Quarts, *Hypericum*, Hyssop, Milfoil, of each 2 Handfuls; Powders of Frankincense and Myrrh, of each 3 Ounces: Let all these be infus'd during four Days, and distill'd in *Balneo Mariae*, or in *Balneo Arenoso*, stopping close the Head of the Alembick and the Recipient: This Water will be of greater Efficacy, when accompany'd with these Powders. Take Frankincense, Mastich, Myrrh, *Sarcocolla*, *Belus Armena*, and Dragons-blood, of each an equal Quantity; which you are to pulverize, and mingle together, in order to be spread over the Wound, bath'd with the preceding Water, and upon the Pledgets dip'd in the same Water.

This compound Oil is also of admirable Virtue for the same Maladies, Take old common Oil five Quarts, Pinetree-Rosin, Turpentine and Wax, of each 2 Ounces; St. *John's-wort*, Rosemary, Roses and Milfoil, of each half a Handful; Saffron 1 Dram, and fresh Hoggs-lard 6 Ounces: Let the whole mixture be set in *Balneo Mariae*, to be afterwards us'd as hot as the Patient can well endure it. Otherwise, Take clear Turpentine, and Plaister of Gum *Elemi*, of each 1 Ounce and a half; Mutton-suet 2 Ounces, and old Hogg-lard 1 Ounce; Infuse all over the Fire, and make a Liniment, to anoint the Wound with a Feather.

The following Plaister is no less recommendable, Take Oil of Roses, Violets, and Camomile, of each 2 Ounces, Hens-grease, and Veal-marrow, of each 1 Dram, Earth-worms, wash'd with strong Wine 2 Drams, Fresh-butter 1 Ounce and a half, Mucilage of Marsh-mallows 1 Pound; and after all have been boil'd together, to the consumption of the Mucilage; strain them, and put into the Liquor, Litharge pulveriz'd fine 5

Ounces, *Minium* 6 Ounces, with as much white Wax as is requisite to make a Cerate; adding Turpentine 2 Ounces and a half, and Mastich 1 Ounce. This Ointment may also be us'd to very good purpose. Take four parts of Sage, with three parts of Milfoil, cut small, and boil'd for two Hours in a Vessel, with Butter 8 Pound: Afterward the whole is to be strain'd; and having set the Liquor over the Fire again, add Harts-grease 2 Pound, and Goats-suet 1 Pound, with Wax 1 Pound, a quarter of a Pound of Pine-tree-Rosin, and Turpentine 1 Pound and a half: These being all boil'd till they are dissolv'd, take the Pan from off the Fire, and slip in as much *Verdet* or *Spanish Green*, as will serve to give the mixture a green Colour. All these Ingredients being well beaten together, with Oil of Spike 2 Ounces, till they are cool, will make an Ointment almost of universal Use.

For Wounds in the Nerves or Ligamentous Parts, the Patient must take inwardly Harts-horn with Amber, and a mixture of distill'd Oil of Wine 1 Ounce, and Camphire half a Dram, to be drop'd into the Cavities. Balsam of *Peru*, with distill'd Oil of Lavender is also of good use in this Case. Or else let the wounded Part be anointed, with a compound of Ointment of Marsh-mallows 4 Ounces, distilled Oil of Bays 1 Dram and a half, and distilled Oil of Amber half a Dram. A Plaister made of *Euphorbium* 1 Scruple, Rosin half a Dram, as much Turpentine, and a little Wax is likewise proper, being apply'd very Hot. Powder of Earth-worms, with Turpentine and Oil of St. *John's-wort* may also be laid upon the Wound. Or else apply at first a mixture of Oil of Turpentine 1 Ounce, and Brandy 1 Dram; to which add a little *Euphorbium*. Otherwise take Venice-Turpentine and old Oil 1 Ounce, with a little Brandy; then the Pain may be asswag'd, and the Tumour abated by the following Cataplasim. Take Barley-meal and *Orobis*, of each 2 Drams; Camomile-flowers and Melilot, of each a Handful; Fresh-butter without Salt 1 Ounce and a half; with a convenient *Lixivium*, Oil of St. *John's-wort*-Seed, in which the Flowers of the same Herb have

have been macerated, ought not to be omitted in Wounds of the Nerves.

The following Ointment is a no less Sovereign Remedy. Take lesser Centory, Dogstongue, *Pilosella*, great and little Comfrey, of each one Handful; Earth-worms half a Pound, common Oil 1 Pint, Wine 1 Pint and a half: Having mix'd these together, leave them to ferment during seven Days, and then add Rams suet 1 Pound; black Pitch and Rosin, of each a quarter of a Pound; Gum Ammoniack, *Galbanum* and *Opopanax* dissolv'd in Vinegar, of each 5 Drams: Let all these Ingredients be boil'd over a gentle Fire, to the consumption of the Wine and Vinegar; and the Liquor being strain'd, put in, when it is almost Cold, of Turpentine half a quarter of a Pound, Frankincense, Mastich, *Sarcocolla*, of each 3 Drams; Saffron 2 Drams, and beat all in a Mortar, to make an Ointment: But if the Nerves be laid bare, nothing must be apply'd that is sharp; and in that case great Relief may be had, by the use of Lime wash'd several times in the Sun, with the sweetest Water, and dry'd, in order to be mix'd with a sufficient quantity of the best Oil of Roses, before it is laid on. *Unguentum Diapompholygos*, and *Emplastrum Diachalciteos*, are proper to compleat the Cure.

When the Wound is in the Joynts, from whence an *Ichor* issues out, it will be proper to apply an Ointment compos'd of Turpentine half an Ounce, wash'd with Sage-water; common Honey, or Honey of Roses 3 Drams, Barley-meal 2 Drams, and Succotrin Aloes 3 Drams and a half. Or else, Take Meal of Linseed, Barley and *Orobia*, of each equal Parts; which you are to mingle with a sufficient quantity of Honey, to the end that all may incorporate together over the Fire; and when the Liquor is Cool, put in Powders of Frankincense and Myrrh, of each half an Ounce. If it be requisite to generate Flesh, for the filling up of a hollow Wound, you are to cover it with the following Medicine, spread upon a Pledget. Take Turpentine 4 Ounces, Oil of Myrtle 2 Ounces; Pine-tree-Rosin and *Colophonia*, of each 1 Ounce; Frankincense 1 Ounce and a half, Dragons-blood half an

Ounce; with a little Wax. This Remedy is also of singular Use; Take Frankincense and Myrrh, of each 2 Ounces, Dragons-blood half an Ounce, *Greek* and Ship-pitch, of each 1 Ounce; Centory 3 Drams, Turpentine and Pinetree Rosin, of each 6 Drams; Cows-suet half an Ounce, Wax 1 Ounce and a half, and as much Oil as is needful, to give it the consistence of an Ointment: And to cicatrise the Wound, Take Turpentine half an Ounce, Oils of Roses and Myrtle, of each 1 Ounce; Mutton-suet 2 Ounces, Wax 2 Ounces; Litharge, burnt Lead, *Minium*, Cerufs, of each 3 Drams; red Coral 1 Dram, prepar'd Tutty 2 Scruples; and make an Ointment of all these Drugs.

To cure the puncture of a Tendon, Take white Lilly-root 4 Ounces, boil'd in Cows-milk, and pound'd; Meal of Linseed and Oats, of each 3 Ounces; which you are to boil to the consistence of a Cataplasm, in the same Milk, wherein the Roots were boil'd; and apply this Remedy Morning and Evening to the part Affected.

In Wounds accompany'd with a Contusion, the Gangreen may be prevented, by applying forthwith Oil of Wax, or Oil of Philothophers, and laying a Plaister of Cummin or Bay-berries over it; the Contusion being almost dispers'd, you are then to make use of Spirit of Sal Armoniack distilled with Quick lime.

When it is requisite to cause Suppuration, as in the most part of Gun-shot Wounds, take an Ointment made of Oil of Lillies, and Violets, in which Puppies newly brought forth, and Earth-worms have been boil'd. When the Suppuration is over, the following Medicine is to be us'd. Take Turpentine 5 Ounces, Oil of Roses 1 Ounce, Honey of Roses 3 Ounces; Myrrh, Aloes, Mastich, round Birth-wort, of each 1 Dram and a half; and Barley-meal 6 Drams; mingle all these together, and if the Wound be remote from the Nerves, put in a little Mercury Precipitate. Otherwise, Take Orrice-root, Flowers of *Panax*, and of the Caper-shrub, of each 2 Drams; round Birth-wort, Manna, Frankincense, of each 1 Dram; with Honey of Roses, and Turpentine, of each 2 Ounces; to make a Plaister.

Plaster of all these Ingredients. An excellent Suppurative may also be prepar'd, with melted Hogs-lard, the Yolk of an Egg, Turpentine and Saffron, after which Deterfives are to be apply'd. It is necessary, in considerable Wounds, to lay over the Dressing, a Cataplasim such as the following. Take Leaves and Flowers of Camomile and Melilot, Wormwood-tops, Mallows, Marshmallows, Seeds of Line and Cummin pulveriz'd. Let the whole compound be boil'd in Wine, and add Barley-meal, to give it a Consistence.

† In Wounds made by the biting of venomous Creatures, as Vipers and Serpents, a red hot Iron is to be apply'd. In the biting of a mad Dog, it is proper to lay on the Part, when scarify'd, Treacle mix'd with Onion, and Cloves of Garlick pounded; and the impression of the Poison being thus taken off, a gentle Digestive is to be made use of, such as *Unguentum Aegyptiacum*, with distilled Vinegar and Treacle.

In superficial Wounds of the Head, Take Oil of St. John's-wort, and Balsam of Peru; upon which is to be laid a Plaster of Betony, with *Tacamahacca*, malaxated with Balsam of Peru: When the *Cranium* or Skull is hurt, without being entirely penetrated, the *Caries* may be prevented, by strewing on the Part, the Powders of Orrice-root, Aloes and Myrrh, impregnated with Spirit of Wine, or Oil of Turpentine; avoiding unctuous Medicines. In a Wound of the Eyes, Repercussives are to be us'd forthwith; and for Narcoticks, Take the Lungs and Caul of a Sheep, boil'd in Milk, and apply them hot to the Temples; Breast-Milk, or Pigeons-blood, taken out of a Vein under the Wing, is also proper in this Case. For Deterfives, you are to apply the Livers of a Thornback, Hare and Partridge, with the Waters of Eye-bright and Fennel, Sugar-candy and Saffron. For a *Sarcotick*, Take Mucilages of *Olibanum*, Gum Arabick, Gum Dragon and *Sarcocolla*, extracted in Barley-water, of each 2 Drams; Aloes wash'd thrice with Rose-water 1 Dram, Cerufs burnt and wash'd, and prepar'd Tutty, of each half a Drain; to make a *Collyrium*. In a Wound of the Tongue, which

admits of no Suture, the Patient is to use Lambitives, such as Syrup of dry'd Roses, and Honey of Roses: Or else, let the Yolk of a raw Egg be boil'd till it is almost hard; adding Syrup of dry'd Roses, to make a Liniment. Afterwards, Take Waters of Plantane and Honey-suckles, of each 4 Ounces; Syrup of dry'd Roses, and an Infusion of Roses, of each 1 Ounce and a half; and make a Gargarism for the Tongue; and let the Patient continually keep in his Mouth, Sugar of Roses, and Syrup of Quinces. Wounds of the Ear require dry Agglutinatives; and when the Suture is made, care must be taken, that the Needle do not make a puncture in the Cartilage, which would occasion a Gangreen. In penetrating Wounds of the *Thorax*, Injections are to be made, with Honey of Roses 2 Ounces, temper'd with Barley-water 6 Ounces; which the Patient is to take, leaning on the side of the Wound, while he makes an Expiration of Breach: You may also inject *Meliceratum*, made of one part Honey, and two or three parts Water, diluted, with Agrimony-Water, or some other of the like Quality, in order to dissolve the grumous Blood. Slight Wounds of the Lungs are to be deterg'd with Milk and a little Honey.

To stop the *Hemorrhage* or Flux of Blood, which immediately entues upon Wounds, where there is an aperture of the great Vessels, Arteries, or Veins: Take Roman Vitriol 1 Pound, Vinegar 2 Pound, *Bolus* and *Crocus Martis*, of each 1 Ounce; this *Crocus* alone, being sometimes sufficient upon these Occasions: *Mercury* sublimate, is also of great Efficacy, when mix'd with *Unguentum Populeum*; *Ufnea* i. e. the Moss of Humane Skulls, or Elder-moss, is likewise serviceable for the stanching of Blood. Otherwise, Take Quick-lime, white Vitriol and Aloes pulveriz'd, of each equal Parts; and strew this Powder upon the Wound. Otherwise, apply *Crepitus Lupi*, well dry'd and press'd, or else steep'd in Vitriol of Mars, with half the quantity of Allum, in an Astringent Decoction, laying Canvas Bolsters over all. When the Wounds are deep, Powder of *Bolus Armena*, and *Terra Damnata*, of Vitriol is to be strew'd upon the Part. fresh

Terra Vitriolica, dulcify'd with *Terra Sigillata*, and the white of an Egg, *Ufnea*, the fresh Dung of an Ass, mix'd with the dry'd Blood that issues from the Wound; Pledgets soak'd with *Allum* and Frogs-Sperm; or else *Crocus Martis* an Ounce, with *Terra Vitriolica* dulcify'd half a Dram, and Vinegar distilled from very strong Wine an Ounce, are the best Remedies. Cataplasms are usually made with Powders of Aloes, Dragons-Blood, *Bolus Armena*, and Whites of Eggs, all mingled together for this Purpose. Otherwise, & Vinegar two Ounces, Colcothar a Dram, *Crocus Martis* two Drams; beat these together, and dip the Lint into this Compound, in order to lay it on the Wound, with *Crepitus Lupi* pulveriz'd: Take Care to make a good Bandage on the Part, to keep on the Medicine. Or else, you may mingle Meal-dust that sticks to Mills, and Powder of Worm-eaten Oak. The Potential Cautery is also very efficacious; which is made of equal Quantities of Vitriol and *Crepitus Lupi*, to be laid on a little Lint, and applied to the Place from whence the Blood runs out; taking Care to avoid touching with this Compound a Nerve or Tendon, which would raise Convulsions.

An Hemorrhage, proceeding from the Nostrils, may be stanch'd by Medicines taken inwardly, such as the following: & Seed of Purslain, Plantain, Sorrel, Endive, and white-seeded Garden-Poppey, of each a Dram, Root of great Comfrey an Ounce: Let these be boil'd in a sufficient Quantity of Water, to the Reduction of nine Ounces, adding to the strained Liquor Syrups of Myrtle, Pomegranate, Poppey, and *Nymphaea*, of each half an Ounce, and mingling all together: The Juice and Seed of Nettles, *Hematites*, or Blood-stone, &c. are also used with good Success: Neither are Narcoticks or Soporatives to be omitted in Cases that are almost desperate: For Example; & Seed of White-seeded Poppey half a Dram, White Hen-bane, and *Hematites*, of each a Scruple, Red Coral a Dram; mingle and pulverize these, to be given at one Dose in Conserve of Roses, six Drams. Or else let the Pa-

tient take Nettle-water an Ounce, with Powder of *Cranium Humanum* a Scruple; the Juices of Nettle, Purslain, Plantain, and Milfoil, may be taken in like Manner. As for Topicks, Swines-dung likewise mixed with Nettle juice is to be applied to the Nostrils, or else a Sponge dipp'd in Oxy-crut, under the Arm-pits, while Piony-root is put under the Tongue, and *Nigella*-root chew'd, and thrust up the Nose.

For the Inflammation of Wounds, take Quick-lime, in which *Saccharum Saturni* and Camphire have been dissolv'd; the distilled Water of putrified Cray-fish, or else the Juice of Cray-fish has also a particular Virtue in this Case. In a Mortification, the Part is to be embrocated with Wine, wherein Wormwood, St. John's-Wort, Rosemary, and Aloes, have been boil'd; or else with Spirit of Wine impregnated with Camphire and Saffron.

Convulsions are prevented in asswaging the Pains of Wounds received in the Nervous Parts, by applying outwardly Oil of Earth-worms, with the distilled Oils of Amber and Bays; or else Ointment of Marsh-mallows, with Balsam of Peru, and distilled Oil of Lavender. But when the Convulsions are raised, the Patient is to make use of Medicines mix'd with Amber, and Volatile Salts extracted out of Animals. It is also proper to prescribe ten or twelve Drops of Spirit of Harts-horn, or of Humane Blood, or *Sal Armoniack*, to be taken Morning and Evening in a Spoonful of the following Julep. & Earth-worms, and Dew-snails, of each six Ounces, compound Horse-radish-Water two Ounces, and Sugar three Ounces, to make a Julep. Otherwise, & Powder of prepared *Millepedes* or Wood-lice three Drams, *Amnium-feed* a Dram, and having made the Mixture, order it to be taken in White-wine: Otherwise, let ten or twelve Wood-lice be beaten in White-wine, which you are to strain, and give the Liquor in two Doses.

For Topicks, begin at first with the most gentle Resolutives; such as Oils of Camomile, Anis, Goose-grease, &c. Sulphurous and dry Baths, or vaporous Baths, made of Decoctions of Sage, Rosemary,

Stachas, *Chamapitys*, *Origan*, and the like in Vinegar, are salutary in this Case; as well as Fomentations with Brandy, on the hinder Parts of the Head and Neck. If Fevers arise, which are usually preceded by a Sense of Heat in the Wound, let the Patient take Crabs-eyes in distill'd Vinegar, *Antimonium Diaphoreticum*, and Magistery of Coral, with Lemon-juice, or Spirit of *Sal Armoniack* in vulnerary Positions.

Remedies for Ulcers.

In order to cure Ulcers, the following Digestive is to be made use of; & Turpentine an Ounce, the Yolk of an Egg, Honey of Roses half a Dram and Oil of *Hypericum*, all mingled together; and when the Pus is formed, apply Medicines that serve to mundify, and absorb the Acid: For Example; & Tobacco-leaves two Handfuls, Tops of Wormwood and *Veronica*, of each one Handful, round Birth-wort-root an Ounce, Juniper-berries half an Ounce Crude *Allum* a Dram, and let all boil in a sufficient Quantity of Forge-water, in order to pour the strained Liquor into the fistulous and fordid Ulcer. Otherwise, take Juices of Tobacco, Plantain, Wormwood, and Betony, with Honey of Roses, of each four Ounces; let all be beaten together over a gentle Fire, adding *Crocus Martis*, Mercury Precipitate, Aloes, Myrrh, and Flowers of Sulphur, of each a Dram, with as much Balsam of *Peru* as is needful to make a Mundificative Ointment. The Ulcer is to be consolidated with Quick-lime, wash'd twice or thrice, and afterward dried, to be mix'd with Linseed-oil, and a little *Bole Armoniack*. The Caries of the Bone may be corrected by sprinkling thereon some Drops of rectified Spirit of Wine, or distilled Oils of Cloves and *Guayacum*; or by strewing upon the Part Powder of *Euphorbium* and Orrice-root. Or else take Litharge of Gold two Ounces, Oil of Roses a Pound; boil these in a Glass-Vessel, and afterward put in new Wax three Ounces, Liquid *Syrax* one Ounce, Honey an Ounce and a half: Let

all boil together, that they may be well incorporated; and having removed the Vessel from the Fire, add Powders of Frankincense and Myrrh, Mercury Precipitate, Oil of Turpentine, Wax, and Pine-tree Rosin, of each an Ounce.

In an Ulcer, where the Heat is considerable, wash the Part affected with Plantain-water or Rose-water, &c. and then apply a refrigerating, desiccative, and incarnative Ointment, such as the following, which is approved of especially in Ulcers of the Legs: Take Cerufs an Ounce, Litharge an Ounce and half, Mastick, red Coral, Ointment of Roses, Dragons-blood, Camphire, of each half an Ounce, *Unguentum Populneum* six Drams, Oils of Roses and Violets, Waters of *Solanum* and Plantain, as much as is requisite, with a little *Lapis Calaminaris* and Cuttle Bone, to make an Ointment.

For small Ulcers that cause an Excoriation of the Skin and Flesh, it would be advantageous to use at first a Plaister of Cerufs, Litharge of Gold, Myrrh, and Oil of Roses, all boil'd together to a proper Consistence. During the Use of this Medicine, the excoriated Parts are to be washed from Time to Time with the Juice of Groundsel, and then strew'd with the Powders of long Birth-wort and Bay-berries. Lastly, having soak'd Pledgets in Groundsel-juice, in which the preceding Powder has been dissolv'd, they are to be rolled about the Part, and the Malady will be cured in a short Time. Or else take Wax and Rosin, of each an Ounce, Mutton-luet two Ounces, Ship-pitch, and Olive-oil, of each three Ounces, Mastick and Frankincense, of each three Drams, Litharge an Ounce and half, and Cerufs half an Ounce; Let the Oil, Rosin, Suet, and Wax, be boil'd together till the Mixture becomes very glutinous, and then slip in the rest; taking Care to bathe the Ulcer every third Day with warm Wine. You may also apply a *Sparadrap* prepared thus: Take Oil of Roses twelve Ounces, Cerufs three Ounces, Litharge four Ounces and half, Frankincense and Mastick, of each a Dram, Dragons-blood half an Ounce, Myrtle-

Myrtle-berries and *Sarcocolla*, of each two Drains, the whole Compound is to be boil'd a little, till it turns to a red Colour, and the Cloth dip'd therein when it is taken off from the Fire.

Otherwise, take Litharge two Drains, Cerufs three Drains; let these Ingredients, after they have been pulveriz'd, be steep'd in Rose-water, and having dried them, add prepared Tuty and *Pompholyx*, of each a Dram and half, Lead burnt and washed two Drains: These are to be reduced to a very fine Powder, and put into an Infusion made of Gum Dragon in Rose water, in order to add Goats-suet two Ounces, and make a Plaister, with Camphire a Scruple. It is also expedient to stamp green Leaves of *Carduus Benedictus*, and boil them in Wine; afterward adding liquified Boar's-grease, and mingling the Whole with a sufficient Quantity of Wheat-flower, to make a somewhat thin Ointment, with which the Part is to be anointed twice a Day.

Several Practitioners in Surgery usually dress Ulcers of the Arms and Hands with such Medicines as these, viz. Take Wax a Pound, Cerufs eight Ounces, Oil of Roses a Pound, *Sal Armoniack* three Ounces, Brass-Scales two Ounces, Frankincense, *Allum*, Verdegrease, Quick-lime, of each an Ounce, which being melted, are to be mix'd with Wine, and boil'd all together, to make an Ointment. Or else take Oil of Sulphur three Ounces, *Colophonia* three Ounces, Wax half an Ounce: These Drugs being melted, and well mix'd together, put in Myrrh pulveriz'd fine to the Quantity of the said three Ingredients, and boil the Mixture over a gentle Fire, from whence it is to be taken off in a Quarter of an Hour; and having set it by to cool, you'll have a Plaister of great Efficacy for several Sorts of Ulcers, especially if they be washed every other Day with the following Water: Take Plantain-water a Pint, Rose water half a Pint, Orange-flowers three Ounces, Mercury Sublimated pulveriz'd half an Ounce, and let these boil a Quarter of an Hour over a slow Fire. You are to keep this Water

in a Glass-bottle, to be used as Occasion serves.

In deep and fistulous Ulcers, as in the Back, or elsewhere, Injections are to be made, with a Decoction of Barley two Pounds, and Honey of Roses four Ounces; for a greater Mundificative, mingle it with *Unguentum Egyptiacum*, and two Days after with Brandy, two Ounces: Otherwise take *Lignum Sanctum* with its Bark two Ounces, pulveriz'd fine, long Birth-wort, the lesser Centory, Wormwood, Agrimony, Horse-tail, Olive-leaves, Pimpernel, great Comfrey, of each one Handful, Frankincense, Myrrh, *Sarcocolla*, of each half an Ounce, perfumed red Wine three Pints, clarified Honey four Ounces. Let a Decoction be made of all these Ingredients, and then inject the strained Liquor into the Ulcer with a Syringe, adding at that very Instant an Ounce of Brandy for every Time the Injection is made.

When you would Incarnate the Ulcer, take Plantain-leaves two Handfuls, Agrimony, Herb-Robert, and Cinquefoil, of each one Handful, three Wormwood-tops, Horse-tail, Ceterach, St. John's-wort, both Sorts of Comfrey, of each half a handful; Betony one handful and a half; mingle these, and make a Decoction of them in Water, adding at the end, Astringent, red Wine one Quart, red Roses and Myrtle-leaves, of each two Pugils, whole Barley half a handful: Then strain all, and into two Quarts of the Liquor, put Bean-meal an Ounce, *Orobis*-meal half an Ounce, Frankincense, Mastick, *Sarcocolla*, Pine-tree Rosin, of each an Ounce, Myrrh, Florence-Orrice and round Birth-wort, of each half an Ounce, Honey of Roses strained three Ounces. The Mixture made of all these Ingredients is to be injected into the cavernous Ulcer, which you may cover with a Plaister compounded of Litharge of Gold six Ounces, Oils of Roses and green Olives, a Pint and a half, and Vinegar Roses of half a Pint. Boil these together over a gentle Fire, stirring them continually with a *Spatula*, till the Compound has contracted a black Colour, and the Consistence of a Cerate, to make a Plaister.

For a Tortuous Ulcer, take Oil of bitter Almonds, Juice of Sevil-Oranges, and Malmsey-Wine, of each half an Ounce, Powders of *Coloquintida* and lesser Centory, of each two Drams, with a sufficient Quantity of Wax. When the Bone is corrupted, the following Powder may be used to good Purpose; Take round Birthwort, Orrice, burnt Aloes, Root of *Pencedanum*, Brass-dross, Pine-tree-Bark, of each an equal Quantity; let these be pulveriz'd, and add Honey to make a Plaster.

If the Edges of the Ulcer are become callous it will be proper to make use of *Waricrus's* Brown Ointment, or *Unguentum Egyptiacum*, with Balsam of Sulphur, Turpentine, and Camphire: Or else take *Unguentum Egyptiacum* half an Ounce, Mercury Precipitate a Dram, Plantain-water four Drams, Rose-water two Ounces: When all is boil'd together to the Diminution of a third Part, spread some of this Ointment upon the Pledgets which are to be apply'd to the Aperture of the Ulcer. The two following Plaisters are serviceable for a great Number of Ulcers; Take Mastick an Ounce, *Venice-Turpentine* three Ounces, yellow Wax four Ounces, and give all the Form of a Plaster. Or else take Betony, Agrimony, Vervin, and Pimpernel, of each one Handful, Wax, Turpentine, and Rosin, of each one Pound, Mastick one Scruple, best White-wine three Pints: Boil the whole Compound to the Consumption of a third Part, and strain it, to make another Plaster.

Ulcers of the Eye, which appear as white Specks, when they are in the Corneous Tunicle, or as red Specks, when they are in the White of the Eye, are cured with Anodyns and Deterfives, such as Sugar, Honey, Saffron, Myrrh, and Frankincense; a little Vitriol dissolv'd in a considerable Quantity of Rose-water, is one of the best Deterfives: Or else take three Parts of Strawberry-water, distilled with one Part of Sugar in *Balneo Mariae* during eight Days, and add an Infusion of Rue and *Marrubium* in Eye-bright-Water, into which has been put *Sarcocolla* and Aloes in a Rag ty'd

up into a Knot, which is to be afterward squeezed out. Verdegrease is good for an Ulcer in the *Caruncula Lachrymalis*.

An Ulcer of the Ear is mundified with Juice of Beet and Hore-hound, Oil of bitter Almonds, Juice of Onions, with Honey of Roses, and the Juices of *Arum* and Piony. The Pus or Matter that issues out of it is to be taken away with Wool, and then it is requisite to put in a small Probe cover'd with Cotton, which has been at first soaked in Water mix'd with Honey, afterwards in Wine, and at last in Oxy-mel. The Pain of the Part may be asswaged by putting in some Drops of an Infusion of Frankincense made in Milk.

Ulcers of the Nose are sometimes cured with Juice of *Nasturtium* and *Allum*, and sometimes with *Sal Armoniack* and Vinegar. Or else, take red Roses, Myrtle-berries, *Calamus Aromaticus*, *Angelica*, Gentian Mace, and Cloves, of each half a Dram, Camphire and Amber, of each four Grains, and Musk six Grains; let all these be pulveriz'd, and snuff up the Nostrils.

In an Ulceration of the Mouth, the Part is to be washed with Damask Rose-water, or else with a Mixture of Water and Milk. The following Decoction may also be used for the same Purpose; Take Marshmallow-root, and cleans'd Barley, of each an Ounce, Quince seeds half an Ounce; boil these in a sufficient Quantity of Water till it is reduced to a Quart, and make a Gargarism.

In Serpentine Ulcers of the Mouth, Gums, and Throat, take Verdegrease or Copper-rust a Dram, and Orpiment a Dram and a half; let these be pulverized, and boil'd in White-wine four Drams, to the Consumption of one half. The Decoction being cool, put in Waters of Roses and *Solanum*, or of Plantain, of each an Ounce and a half, to make a green Water, with which you are to wash the Ulcers. If the same Parts are seiz'd with Venereal Ulcers, take Plantain-water one Quart, *Unguentum Egyptiacum* four Ounces, and wash those Parts with this Liquor. For the Hemorrhage of the Ulcers, take Meal-dust mix'd with *Bolus* and Dragons-blood, and

and put a great deal of this Mixture into those Cavities.

For Ulcers that break out in the *Præputium*, and Glands in Venereal Diseases, take *Unguentum Basilicon* six Drams, Ointment of Tobacco two Drams, Precipitate wash'd in red Rose-water half a Dram; mingle all together, and having made a Liniment, spread it upon the Lint, which is to be apply'd to the Ulcers after they have been bathed with the following Fomentation; Take Roots of Marsh-mallows and Lillies, of each an Ounce and a half, Leaves of common Mallows, White Mullein, and Hen-bane, with Camomile-flowers and Melilot, of each a Handful, Seeds of Line and Fenugreek, of each half an Ounce; and let all boil in a sufficient Quantity of Spring-water, in order to foment the affected Part.

An Ulcer of the *Intestinum Rectum* may be cured with the following Balsam: Take Flowers of *Tapsus* and *Hypericum*, and Leaves of *Prunella*, of each a Handful; boil these in the press'd Oil of St. John's-Wort-Seeds with an equal Quantity of old red Wine, till the Wine be evaporated, so that a Drop of the Liquor let fall upon the Fire rises up in a Flame without any Crackling, and then the Medicine will be brought to Perfection.

In order to cure an Ulcer of the Reins, accompany'd with Sharpness of Urine, the Patient, must take a laxative Medicine; such as a *Bolus* made by mingling Extract of *Cassia* an Ounce, and Turpentine wash'd in Violet-water a Dram and a half, with a little Sugar and Liquorish pulveriz'd. Afterward the following Apozeme is to be prepared: Take cleans'd Barley a Pugil, Lettice, Mallows, Purslain, Violet-plants, Wild Succory, of each a Handful, of the four greater cold Seeds, a Dram and a half of each, Violet-flowers and *Nymphaea*, of each a Pugil, white Poppey-seed two Drams, Jujubes and Sebastens, fix of each: Having made a Decoction of all these Ingredients, you are to dissolve in a Pint of the strained Liquor Syrup of Violets and *Nymphaea*, of each an Ounce, with Syrup of Maiden-hair and Poppey, of

each half an Ounce, to compleat the Apozeme. Afterwards the following Electuary is to be taken for a Week: Take Sugar of Violets four Ounces, Conserve of Roses made a Year ago half an Ounce, Mallowseed two Drams, white Poppey-seed one Dram, the four cold Seeds a Dram and a half of each, white Hen-bane-seed two Scruples, Powder of Liquorish three Drams, Seed of *Alkakengi*, with their Pods dried, four Scruples, Liquorish-juice half an Ounce, *Bolus Armena* and Trochisks of *Terra Sigillata*, of each half a Dram: Make up the Electuary compounded of all these Ingredients with Syrup of Maiden-hair and Violets, and let the Patient take every Day a Quantity of it, about the Bigness of a Chest-nut; and at last, you are to prescribe Cows-milk, with a little *Bolus Armoniack*, and Conserve of Roses.

If there be an Ulceration in the Bladder, let the Patient take every Day three Pills made of *Venice-Turpentine* wash'd in Horsetail-water two Drams, Powder of Liquorish one Dram, and Juice of the same half a Dram. And for Ulcers, as well in the Reins as in the Bladder, the following Trochisks are much recommended: Take *Bolus Armena*, Dragons blood, *Spodium*, red Roses, Myrrh, of each half a Dram, Gum-Arabick, Gum-Dragon, cleans'd Barley, Myrtle-berries, and Liquorish, of each two Drams, Seeds of white Poppey, Cottonweed, Purslain, and Quinces, of each one Dram, with a sufficient Quantity of the Mucilage of Flea-bane-seed, prepared in Plantain-water, to make Trochisks, the Dose of which is to be from a Scruple to a Dram, dissolv'd in Goats-milk, or in a Decoction of Barley: It would also be expedient to make Injections of this Liquor into the Bladder. Some prescribe, with good Success in the same Maladies, Filicrust of Steel, liquified and macerated in strong-body'd sweet Wine, to be taken in the Morning in Maiden-hair-water, or in Ass's-milk.

For Ulcers in any Member of the Body whatsoever, you may make use of Water of Plantane and Allum; or else *Egyptiacum* and Treacle infus'd in Spirit of Wine; Pledgets

Pledgets soak'd in Wine, in which Gunpowder has been dissolv'd to wash the Ulcers, are likewise very beneficial in this Case. Or else, Take *Saccharum Saturni*, Camphire and Soot, and having incorporated them together, with the Juice of Sow-thistle and Plantane, in a leaden Mortar, make a Liniment, in order to anoint the Part gently, which is to be afterward cover'd, with a simple Canvas Pledget, or a Leaf of Cap-Paper. Otherwise, let Water of distilled rotten Apples be mix'd with the extract of round Birth-wort Roots made in Spirit of Wine, and take it for an Injection. In general, the Remedies which are proper to mundifie and desiccate Ulcers, may be reduc'd to Liquors; as the Waters of Bryony-roots, great Celandine and Lime; the Tinctures of Myrrh, Aloes and Saffron; and Whay, in which *Saccharum Saturni* has been dissolv'd: Or else, Powders, such as those of Allum and Ciunabar, which are burnt to make a Furnigation about Ulcers, by means of a Funnel, Meals of several sorts, and Powder of worm-eaten Oak: Or else, Ointments or Plaisters, as that of Betony, *Emplastrum Diasulphuris*, *Desiccativum Rubrum*, &c. An Ointment may be also prepar'd with three Yolks of Eggs, Honey half an Ounce, and a glass of Wine; beaten all together. Otherwise, let Lime wash'd and dry'd several times, be mix'd with Oil of Linseed and *Bolus*; and to render it more Desiccative, add a little Precipitate thereto.

A *Lapis Medicamentosus* may also be made, which is of singular use, as well in Ulcers as Wounds: For that purpose, Take green Vitriol 1 Pound, white Vitriol half a Pound, Allum 1 Pound and a half; *Anatron* and common Salt, of each 3 Ounces; Salts of Tartar and Wormwood, Mugwort, Succory, *Persicaria* and Plantane, of each half an Ounce, put these into a glaz'd earthen Pot, drop in a little Vinegar of Roses, and let all boil over a gentle Fire, stirring them about often. When the whole mixture begins to grow thick; add *Venice-Ceruss* half a Pound, *Bole-Armick* 4 Ounces, and mingle all

these Ingredients together, till the heat of the Fire has brought them to the hardness of a Stone: Then removing it from the Fire, break the Pot, and take out the whole Mass, which is to be kept for use: If you think fit to put Myrrh and Frankincense into this Compound, it must be boil'd over a slow Fire, lest these Gums should burn, and lose their Virtue.

This Preparation is also made after another manner, *viz.* Take Vitriol one Pound, Nitre half a Pound, Ceruss, Allum, *Bole-Armoniack*, of each four Ounces; *Ammoniack* two Ounces; pulverize all, after having before ground the Ceruss and *Bolus* on a Marble-stone, and let them simmer gently in an earthen Vessel, till the matter be petrified. Otherwise, Take Allum four Ounces, Vitriol of *Hungary* two Ounces; white Vitriol, Tartar, Borax, Mastick, Frankincense, Sal *Armoniack*, of each one Ounce; Ceruss six Ounces, *Bolus Armena* three Ounces; let all these be beaten gross, and boil'd over a slow Fire, with strong Vinegar in a glaz'd earthen Pot. When there is occasion to make use of this Stone, an Ounce of it is to be dissolv'd in a Pint of Water, which must be strain'd, to soak the Pledgets, that are laid Night and Morning on the Cavities, in which some of this Liquor is also drop'd: But its Acrimony hinders it from being us'd in the Ulcers of Nervous or Inflamed Parts, as well as in cancerous Ulcers.

Remedies for Burns.

Superficial Burns are sometimes cur'd by a speedy Application of Dirt or Mud upon the Part; an Ointment may also be made for them, with Bay-leaves stamp'd, and boil'd in Hogs-lard, to rub the burnt Parts: or else, Take Honey and Wheat-flower, of each equal Parts; with the Yolk of an Egg; then beat these together, and lay them on the part Affected. Or else make a mixture of Oil of *St. John's-wort* one Ounce, with Lime quench'd and well wash'd two Scruples, and anoint the Part with

with it. Others cause Ivy-leaves to be boild in Water or Beer, and apply them Hot.

In Burns of all the Parts of the Body, except the Face, this Ointment may be made use of. Take Liquid Soap half a Pound, raw Onions two Ounces, Salt one Ounce and a half, Oil of the Yelks of Eggs one Ounce, Oil of Roses and sweet Almonds, of each 3 Ounces; Mucilage of Quince-seeds two Ounces; and make an Ointment of these over the Fire. For an *Anodyne Collyrium*, Take Rose-water three Ounces, Plantane-water one Ounce, Seeds of Quinces and Fenugreek, of each one Ounce; Mingle these together, and let them infuse over hot Ashes, during an Hour. Afterwards having strained the Liquor, put in a little Breast-milk, and let this Medicine be drop'd hot into the Eyes. For the other parts of the Face, you may apply the following Ointment. Take Gum *Elemi* one Dram, Oil of Egg-yolks and Roses, of each three Drams; and *Venice-Soap* two Ounces: Then having dissolv'd the Gum in the Oils; mix all in a Mortar, to make an Ointment, which is to be spread upon a Linnen-cloth, in order to cover the whole Face.

For Burns made by fir'd Gun-powder, Spirit of Wine or Brandy, or Olive-Oil beaten with Salt, Juice of Onion and Verjuice, is a good Remedy, when they are Recent; and if they be only superficial, Take Quick-lime, two Pugils, with the like weight of Milk-cream, and clarify'd Honey, to be mix'd and brought to the consistence of an Ointment: Or else, put Quick-lime into common Water, so as the Water may rise four Inches above the Chalk, and when the Effervescence is over, pour in Oil of Roses, to form a kind of Butter, which is to be laid upon the Part. Or else, Take raw Onions one Ounce and a half, Salt and *Venice-Soap*, of each half an Ounce: Let all be beaten in a Mortar, and a sufficient quantity of Oil of Roses slip'd in, to make an Ointment: Otherwise you may mingle stamp'd Crayfish with Fresh-butter; then boil and scum the Mixture, till a red Ointment is pro-

duc'd, which must be strain'd before it is us'd. The Mucilages of Quince-seeds, prepar'd with Frog-spawn, and mix'd with *Saccharum Saturni*, is also a proper Remedy. If the Burn be accompany'd with small Blisters: Take green Sage-leaves a Handful, Plantane two Handfuls, Fresh-butter six Ounces, Pullets-dung three Ounces; let the whole compound be fry'd a quarter of an Hour, and afterward press'd out, in order to be kept as a Liniment of great Efficacy. If the Skin be ulcerated, apply an Ointment made of the inner Bark of Elder, boild in Olive-Oil; adding after the Liquor is strain'd, two parts of Ceruss, and one part of burnt Lead, with as much Litharge, all stir'd in a leaden Mortar. Otherwise, Take Butter without Salt, *Unguentum Basilicon*, Oil of white Lillies and Egg-yelks two Drams, and make an Ointment of the whole Mass; which you are to lay upon the part Affected, after it has been wash'd before, with a Decoction of Fenugreek and Melilot-flowers. The following Anodyne may be likewise us'd to very good purpose. Take Oil of sweet Almonds, Ointment of Roses, and white Wax, of each one Ounce Let these be dissolv'd together, and then add Camphire one Scruple, with a little Mucilage of Quince seed, to make up the Ointment.

In case the Burn has penetrated very far, and it is apprehended lest the Humours and Blood should fall upon the Part, recourse may be had to Deterfives, such as the following, viz. Take *Solus Armena*, Dragons-blood, Gall-nuts, *Crocus Martis*, and *Acacia*, of each half an Ounce, Oil of Roses three Ounces, and new Wax one Ounce and a half; make an Ointment of these, adding a little Vinegar: Or else take Barley-meal, Clay or Loam, with which Ovens are made, of each two Ounces: Boil these in Vinegar and Water, to the consistence of a Cataplasin; and then mix the Compound with two whites of Eggs. The Application of this Remedy must be repeated twice a Day, of which a Plaister is to be made, about as large as the Palm of one's Hand, to cover the most distemper'd

per'd Part; and the following Ointment must be laid upon the entire Part: Take *Unguentum Basilicon* one Ounce, Oil of Roses and white Lillies, of each half an Ounce; and the Yelks of two Eggs; and let these Ingredients be mingled together, to make the Medicine compleat. To dissolve the Humours that are lodg'd in the Part, Take fresh Butter and Hens-grease, likewise fresh, of each one Ounce, new Wax, and Oil of white Lillies, of each half an Ounce. When these are melted over the Fire, you are to add Saffron one Scruple, and Mucilage of Quince-seeds one Ounce, in order to beat the whole in a Mortar, and make an Ointment.

The following Remedy may serve for all sorts of Burns: Take fresh Butter wash'd in Rose-water three Ounces, Oils of Violets, Egg-yolk, and sweet Almonds, of each half an Ounce, Barley-meal one Ounce and a half, Saffron one Dram, Quince Mucilage one Ounce, with a sufficient quantity of Wax, to make an Ointment: But so far as Burns in the surface of the Body, excite great Pains, when they are mundify'd; some are so provident as to cover the Ulcers with a very fine and thin piece of Linnen, which they do not take away in dressing the Part, till these Maladies come near their perfect Cure; the Pus having liberty to issue out through the Pores of that Cloth, which likewise gives passage to the Energy of the Medicine. When a Crust is form'd, prepare a Liniment of fresh Butter, beaten in a Leadn Mortar, with a Decoction of Mallows; and spread it on very hot Cabbage-leaves, with which the Escar is to be cover'd, after the Blisters are prick'd.

To consume the Excrecences of Flesh occasion'd in Ulcers, by the moistness of the Medicines, or the abounding of nutritious Juice: Let Crude-allum, and Verdegrease, of each two Ounces, be boil'd in Wine eighteen Ounces; which being reduced to a fourth Part, you are to strain the Liquor, and add Camphire one Dram, dissolv'd in Spirit of Wine one Ounce. It is also advisible to make a corrosive Powder, which is of admirable Efficacy for di-

minishing superfluous or proud Flesh: Take Pomegranate Rinds, Gall-nuts and burnt Sponge, of each an equal Quantity; to be pulveriz'd, and strew'd over the Part, on which this compound Powder must be kept by means of some particular Plaster. *Unguentum Aegyptiacum* is also very serviceable for this purpose; since it consumes the Flesh, without causing Pain, or troublesome Prickings; as well as the Powder but now prescrib'd. *Unguentum Apostolorum* is no less recommended, as well as the single Powder of Hermodactyls, or of Daffodil-husks: Or else take pulveriz'd *Crocus* of Metals, at Discretion, which speedily consumes soft and superfluous Flesh. Excrecencies which sometimes arise in the roof of the Mouth, after an Excoriation, may be cur'd by touching the Tumour with Oil of Vitriol.

When the Malady degenerates into a Gangreen, the spreading of it may be stop'd, both by Internal Remedies; as Spirit of Wine impregnated with Camphire, Preparations of Lemmon with the same Gum, Spirit of Elderberries, Spirit of Harts-horn, Theriacal Spirit camphirated, &c. And by External Remedies; such as Pledgets soak'd in Theriacal Spirit with Camphire, and strewings of Aloes and Myrrh pulveriz'd; or a Decoction of Quick-lime, to which are added *Mercurius Dulcis*, and Spirit of Wine: Likewise a Decoction of Sal Armoniack in the Patient's Urine; or a Decoction of Antimony-Scoria in Vinegar; or else a Decoction of the *Caput Mortuum* of *Aqua-fortis* distill'd with Rose-water, &c. in which Decoctions the Pledgets must be also dip'd before they are laid on the Part. If the Gangreen proceeded from Cold, it would be expedient to rub the part Affected with Snow, and let the Patient drink Treacle infus'd in Wine, to cause Sweating; and the coldness being somewhat diminished, gentle Frictions are to be made with Oil of bitter Almonds, as well as Fomentations with Milk, or else with a Decoction of Rosemary.

In a *Sphacelus*, you are to strew Powders of Orrice Root, Gentian, *Aristolochia*, Centory,

Centory, Pine-tree-Bark, Myrrh and Ceruss; and if the diseased Part be entirely depriv'd of Sense, it must be separated from the Sound, by means of a hot Iron, or Butter of Antimony, with which a Circle is to be made round the Gangreen. In case the *Sphacelus* be not very considerable, you are to bathe with Spirit of Wine and Vinegar the Parts that have been Scarify'd, and afterward anoint them with *Unguentum Egyptiacum*, or *Hartman's Linniment*; made of *Mercury Precipitate*, boil'd to a moderate Consistence in Oil of Walnuts. During this Course, apply to the Sore and other Parts near it, Compositions of *Scordium*, Wormwood, Juniper-berries, Myrrh and Aloes, boil'd in Vinegar or Wine; adding Allum, Vitriol, and Sea-Salt.

If the Gangreen proceeds from an Inflammation, the following Defensative is to be laid on the Part. Take Barley-meal four Ounces, *Bolus Armena* two Ounces, Powders of green Gall-nuts, Cypress-nuts, and Pomegranate Rind one Dram and a half; Camphire one Dram, with Oxymel, to make a Cataplasim, which must be apply'd to the Gangreen. Some Surgeons forbid the Application of Oils, lest by stopping up the Pores, and hindering insensible Transpiration, the Matter of the putrid Vapours should be repell'd inward. The Flesh must be scarify'd more or less deep, according to the situation and bigness of the Gangreen; and when by this Operation, a little Blood has been drawn from the Part, Leaches are to be apply'd, after which you are to bathe the Part with Vinegar and Sea-Salt, mingled together, to prevent Putrefaction.

But if the Gangreen be spread very far, a more efficacious Lotion is to be us'd, such as this, *viz.* Take a strong *Lixivium*, and good Vinegar, of each three Pints; *Scordium*, both sorts of Wormwood, Rue, and Lupins, of each half a Handful; all stamp'd; round Birth-wort-Root, and *Vincetoxicum*, of each half an Ounce; Sea-Salt four Ounces: Let these be boil'd in a sufficient quantity of Water, to the consumption of a third Part; and in the strained Liquor, dissolve Aloes, and Myrrh, of

each half an Ounce; Brandy two Ounces, Camphire half a Dram, and make a Fomentation, bathing the Part with this Liquor, which is to be warm'd as often as you make use of it; and afterward the entire scarify'd Part must be cover'd with a Plaister of *Unguentum Egyptiacum*. Otherwise, Take Verdegrease four Ounces, Honey clarify'd, with a Decoction of Wormwood and *Scordium* sixteen Ounces, Vinegar of Squills six Ounces, Rochellallum, and Sal Armoniack, of each one Ounce; Juice of Rue, both kinds of *Scordium*, and *Alliaria*, of each three Ounces: Boil all these till the Honey grows thick, and then mix them with Treacle and Mithridate, of each half an Ounce; Camphire one Ounce, and make an Ointment to be laid on the Part affected.

The following Cataplasim resists Putrefaction, dries up the excrementitious Humours, and asswages the Pain. Take Lupin-meal, Lentils, Beans, *Lolium* and Sea-Salt, of each three Ounces, Powder of Wormwood-tops, both kinds of *Scordium*, *Alliaria*, Rue, of each one Ounce. These are to be boil'd in Oxymel, and a Cataplasim made of them; adding when it is cooled, Aloes and Myrrh, of each one Ounce; and Brandy three Ounces. In the Preparation, care must be taken, not to let the Meals boil too long with the Powders, which would make the Medicine more viscous than is requisite: When it is us'd, it must be always heated again a little; and you must not fail to envelope the Part in warm Linen-cloths, to bring back the native Heat.

The last Remedy to stop the progress of the Putrefaction, is the actual Cautey, or Red-hot Iron, apply'd to the Gangreened Flesh, so as to produce an Escar or burnt Crust, which must be separated, as soon as is possible, by some sort of Ointment, such as the following: Take Cichmeal, round Birth wort Root, *Florence-Orrice*, *Vincetoxicum*, and *Angelica*, of each half an Ounce; Treacle two Drains, with as much Honey of Roses, as is needful, to make an Ointment, after the use of which the Ulcer is to be mundify'd with the following Medicine. Take Juices of

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Smal-

Smallage, *Scordium*, *Arnoglossum*, Rue, of each four Ounces, and Honey of Roses 1 Pound: Boil all these to the consistence of Syrup; and then mingle all with Lupin-meal, Powder of round Birth-wort, *Angelica*, *Vincetoxicum*, Treacle, of each half an Ounce; Brandy one Ounce, and give all the form of an Ointment, which is to be kept for use in a Glass Vessel.

But if the Gangreen came by travelling long on the Road, in very cold Places, endeavours must be us'd to revive the Part, by means of the following Medicines. Take Powder of Mustard-seed one Ounce, Cloves three Ounces, Oil of Linseed, and Walnuts a sufficient Quantity, and mingling all in a Mortar, make a Plaister to be laid on Hot. Otherwise, Take one Garden Horse radish Root, and one common Radish-Root: Let these be pounded in a Mortar, adding Mustard one Ounce, Cloves pulveriz'd three Drams, Oil of Linseed, and old Walnuts, as much as is necessary for a Plaister, which must be apply'd Hot, and kept on the Part for a Day in a warm

Place. Sometimes a Gangreen has been taken away, by a Lotion made with Water, in which Lime and white Chalk have been boil'd.

In a great Putrefaction, care must be taken to embrocate with Spirit of Sulphur, the Parts that have been scarify'd deep; then they are to be fomented with Spirit of Wine, in which Powder of Aloes and Myrrh have been infus'd. Afterward it is requisite to strew a great deal of the same Powders upon the entire Part, and cover it again with Pledgets soak'd in Spirit of Wine; which will cause the burnt Flesh to be separated from the Sound; especially if this separation be promoted by the use of a Digestive, made of Egg-yelks, Turpentine and Honey. Lastly, if the Part be entirely seiz'd with a *Sphacelus*, that is to say, totally depriv'd of Sense and Life, there is an absolute necessity of proceeding to the Amputation of the Member, to prevent the corrupting of the rest of the Body by the Contagion.

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An ACCOUNT of this Book intituled, Britannia & Hibernia Antiqua & Nova, to be published Monthly, with about 200 new Maps, Cuts, Tables, &c. 'till the whole is compleated, and may be bound up with exact Indexes, &c.

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